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ABSTRACT

This document contains two learning activity packets (LAPs) that outline the study activities for the "brakes" instructional area for an Auto Mechanics I course. The two LAPs cover the following topics: brake systems and power disc brakes. Each LAP contains a cover sheet that describes its purpose, an introduction, and the tasks included in the LAP; learning steps (checklist); pretest; and various assignment sheets. Materials are illustrated with line drawings. The LAPs are referenced to a curriculum guide for the Auto Mechanics I course. (KC)

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ED279811

Learning Activity Packets (LAPs)

Auto Mechanics I

Section E — Brakes

LAP #22 — Brake System
LAP #23 — Power Disc Brakes

CE046472

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AUTO MECHANICS I
BRAKE SYSTEM

Section E--Unit I

LEARNING STEPS

Check the Following
Blanks as You Complete
Each Step.

_____1. Read Unit and Specific Objectives, page 1-E.

_____2. Complete Brake System Pre-Test, LAP page 9.

_____3. Study The sections of the Information Sheet, pages 5-E through 8-E, indicated by your instructor on your Pre-Test. Be sure to study the transparency masters when required.

_____4. Do LAP Assignment Sheet #1, LAP page 19.

_____5. Do LAP Assignment Sheet #2, LAP page 27.

_____6. Check The tasks below which you feel that you can perform without supervision.

Student Check		Instructor Initials/Date	
		Skilled	Moderately Skilled
_____a.	Adjust brake shoes (9).	_____	_____
_____b.	Bleed the hydraulic system (15).	_____	_____
_____c.	Remove, inspect, and replace brake drums (21).	_____	_____
_____d.	Remove and replace brake shoes (27).	_____	_____
_____e.	Remove, recondition, and replace a wheel cylinder (33).	_____	_____

____f.	Remove, recondition, and replace a master cylinder (39).	_____	_____
____g.	Remove, recondition, and replace a tandem master cylinder (35).	_____	_____

____7. Discuss Your competency in each task with your instructor. Your instructor will initial each task in which you demonstrate sufficient competency. If all tasks have been initialed, proceed to Step 51. Otherwise, continue to Step 8.

____8. Refer To Step 6a. If this task has been initialed, proceed to Step 14. Otherwise, continue to Step 9.

____9. Study Job Sheet #1--Adjust Brake Shoes, page 29-E.

____10. Watch Slide/Tape presentation "Adjust Brake Shoes" (E-I-1).

____11. Do Job Sheet #1--Adjust Brake Shoes.

____12. Stop. Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 6a and proceed to Step 14. Otherwise, repeat Steps 9-11 and then go to Step 13.

____13. Stop. Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 6a and continue to Step 14. If additional study is required, discuss a study program with your instructor. Once you have completed that program to your instructor's satisfaction, have your instructor initial Step 6a and continue to Step 14.

____14. Refer To Step 6b. If this task has been initialed, proceed to Step 20. Otherwise, continue to Step 15.

_____15. Study Job Sheet #2--Bleed the Brake System, page 33-E.

_____16. Watch Slide/Tape presentation "Bleed the Brake System" (E-I-2).

_____17. Do Job Sheet #2--Bleed the Brake System.

_____18. Stop. Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 6b and proceed to Step 20. Otherwise, repeat Steps 15-17 and then go to Step 19.

_____19. Stop. Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 6b and continue to Step 20. If additional study is required, discuss a study program with your instructor. Once you have completed that program to your instructor's satisfaction, have your instructor initial Step 6b and continue to Step 20.

_____20. Refer To Step 6c. If this task has been initialed, proceed to Step 26. Otherwise, continue to Step 21.

_____21. Study Job Sheet #3--Remove, Inspect, and Replace Brake Drums, page 37-E.

_____22. Watch Slide/Tape presentation "Remove, Inspect, and Replace Brake Drums" (E-I-3).

_____23. Do Job Sheet #3--Remove, Inspect, and Replace Brake Drums.

_____24. Stop. Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 6c and proceed to Step 26. Otherwise, repeat Steps 21-23 and then go to Step 25.

_____25. Stop. Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 6c and continue to Step 26. If additional study is required, discuss a study program with your instructor. Once you have completed that program to your instructor's satisfaction, have your instructor initial Step 6c and continue to Step 26.

_____26. Refer To Step 6d. If this task has been initialed, proceed to Step 32. Otherwise, continue to Step 27.

_____27. Study Job Sheet #4--Remove and Replace Brake Shoes, page 41-E.

_____28. Watch Slide/Tape presentation "Remove and Replace Brake Shoes" (E-I-4).

_____29. Do Job Sheet #4--Remove and Replace Brake Shoes.

_____30. Stop. Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 6d and proceed to Step 32. Otherwise, repeat Steps 27-29 and then go to Step 31.

_____31. Stop. Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 6d and continue to Step 32. If additional study is required, discuss a study program with your instructor. Once you have completed that program to your instructor's satisfaction, continue to Step 32.

_____32. Refer To Step 6e. If this task has been initialed, proceed to Step 38. Otherwise, continue to Step 33.

_____33. Study Job Sheet #5--Remove, Recondition, and Replace a Wheel Cylinder, page 51-E.

_____34. Watch — Slide/Tape presentation "Remove, Recondition, and Replace a Wheel Cylinder" (E-I-5).

_____35. Do — Job Sheet #5--Remove, Recondition, and Replace a Wheel Cylinder.

_____36. Stop. — Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 6e and proceed to Step 38. Otherwise, repeat Steps 33-35 and then go to Step 37.

_____37. Stop. — Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 6e and continue to Step 38. If additional study is required, discuss a study program with your instructor. Once you have completed that program to your instructor's satisfaction, have your instructor initial Step 6e and continue to Step 38.

_____38. Study — Job Sheet #6--Remove, Recondition, and Replace a Standard Master Cylinder, page 57-E.

_____40. Watch — Slide/Tape presentation "Remove, Recondition, and Replace a Tandem Master Cylinder" (E-I-7).

_____41. Do — Job Sheet #6--Remove, Recondition, and Repace a Standard Master Cylinder.

_____42. Stop. — Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 6f and proceed to Step 44. Otherwise, repeat Steps 39-41 and then go to Step 43.

_____43. Stop. — Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 6f and continue to Step 44. If additional

study is required, discuss a study program with your instructor. Once you have completed that program to your instructor's satisfaction, have your instructor initial Step 6f and continue to Step 44.

_____44. Refer — To Step 6g. If this task has been initialed, proceed to Step 50. Otherwise, continue to Step 45.

_____45. Study — Job Sheet #7--Remove, Recondition, and Replace a Tandem Master Cylinder, page 63-E.

_____46. Watch — Slide/Tape presentation "Remove, Recondition, and Replace a Tandem Master Cylinder" (E-I-7).

_____47. Do — Job Sheet #7--Remove, Recondition, and Replace a Tandem Master Cylinder.

_____48. Stop. — Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 6g and proceed to Step 50. Ohterwise, repeat Steps 45-47 and then go to Step 49.

_____49. Stop. — Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 6g and continue to Step 50. If additional study is required, discuss a study program with your instructor. Once you have completed that program to your instructor's satisfaction, have your instructor initial Step 6g and continue to Step 50.

_____50. Refer — To Step 6. If all tasks have been initialed, continue to Step 51. Otherwise, refer to the step indicated in parentheses after the unsigned task.

_____51. Review — Information Sheet (page 5-E) and Assignment Sheets.

____52. Take Brake System Unit I Test (see your instructor). If your score is 85 percent or above, continue to the next Learning Activity Packet. Otherwise, ask your instructor about additional study requirements and possible re-testing.

BRAKE SYSTEM
UNIT I

PRETEST

NAME_____ SCORE_____

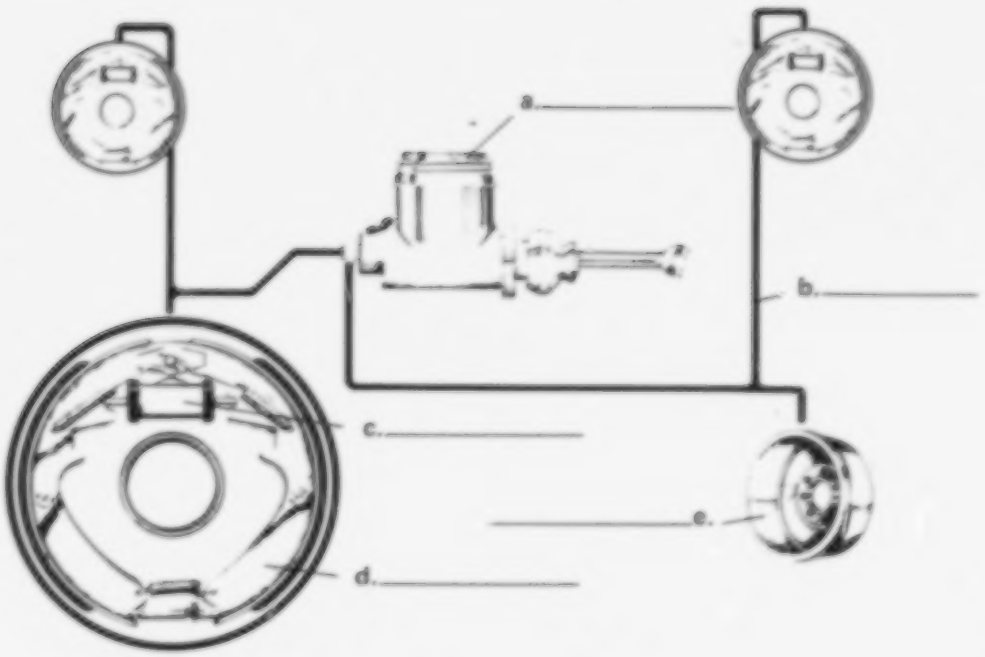
DIRECTIONS: This test is to determine how much you already know about the brake system. Your performance on this test will not be used to determine your grade in the course. Instead, it will guide your instructor in designing this course to meet your needs. Answer only those questions for which you are certain of the answer. Guessing may prevent you from receiving the lessons which are required.

1. Write the purpose of the brake system.

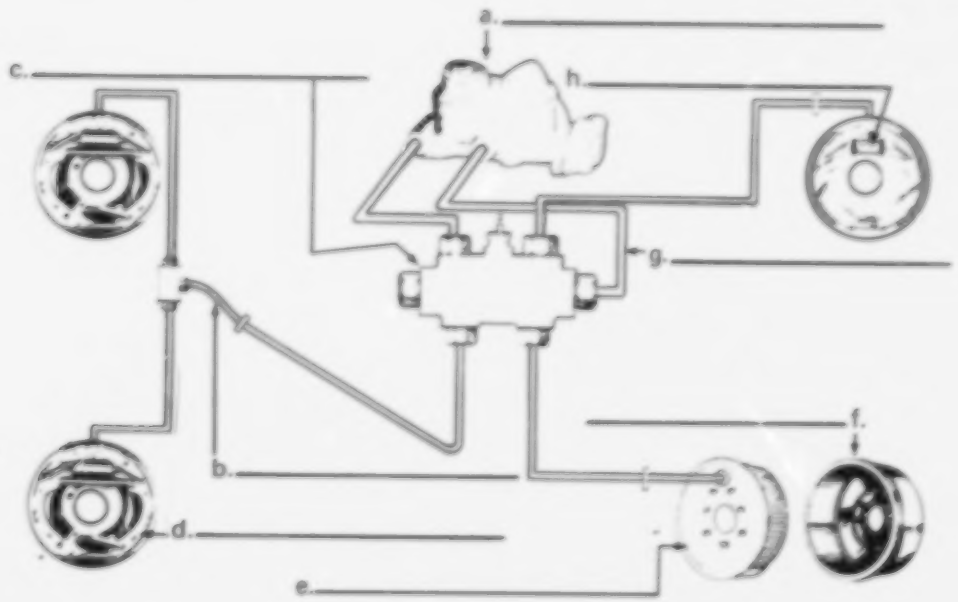
2. Match the terms on the right to the correct definition.

_____a.	Cylinder that produces or is controlled by the motion of fluid.	1.	Brake fluid
_____b.	Refers to the removal of air from the hydraulic brake system.	2.	Hydraulic
_____c.	Special fluid used in hydraulic brake systems.	3.	Hydraulic cylinder
_____d.	Refers to fluid in motion.	4.	Bleeding the brakes
_____e.	Hydraulic cylinder used to force the brake fluid to the individual wheel cylinders when applying the brakes.	5.	Wheel cylinder
_____f.	High pressure line used to force the brake fluid from the cylinder to the wheel cylinders.	6.	Master cylinder
_____g.	Hydraulic cylinder which is actuated by hydraulic pressure to force the brake lining into contact with the brake drum.	7.	Brake drum
_____h.	That part of the brake assembly to which the brake lining is attached.	8.	Brake shoe
_____i.	Cast iron or aluminum housing that rotates around the brake assembly providing a smooth surface for the brake shoes to contact and exert braking action.	9.	Brake line

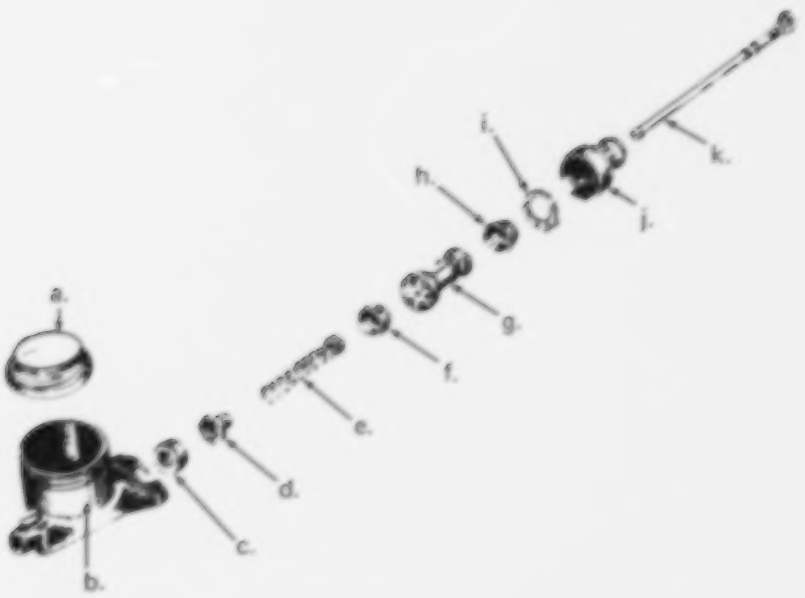
3. Identify the components of the standard brake system in the diagram below by writing the correct names in the blanks provided.



4. Identify the components of the tandem or dual brake system in the diagram below by writing the correct names in the blanks provided.

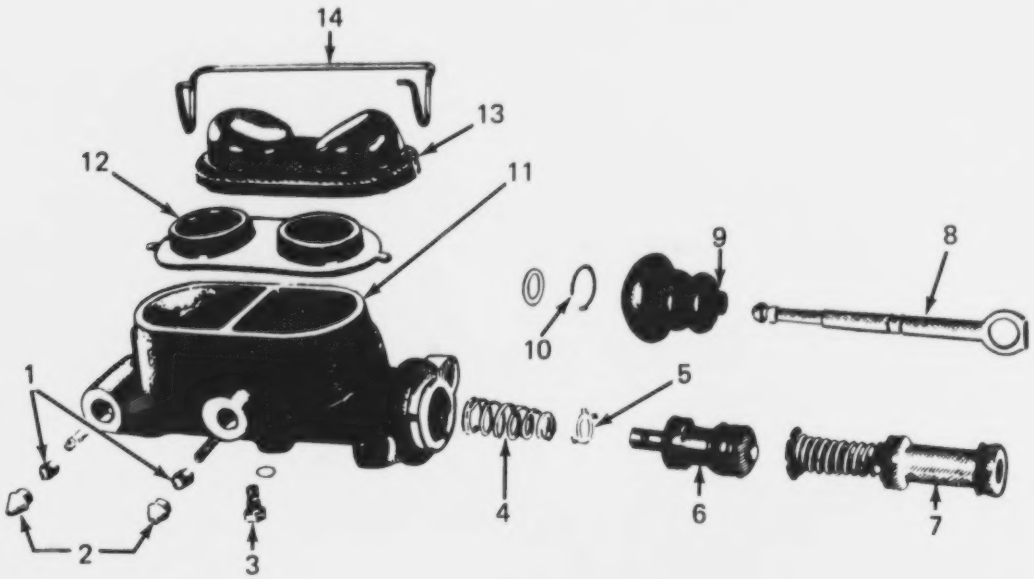


5. Identify the parts of the standard master cylinder in the diagram below by writing the correct names in the balnks provided.



a. _____
b. _____
c. _____
d. _____
e. _____
f. _____
g. _____
h. _____
i. _____
j. _____
k. _____

6. Identify the parts of the tandem master cylinder in the diagram below by writing the correct number in the blanks provided.



_____a. Push rod

_____b. Cover

_____c. Residual pressure check valve

_____d. Diaphragm gasket

_____e. Tube seat

_____f. Return spring

_____g. Secondary piston assembly

_____h. Retainer bail

_____i. Boot

_____j. Cup protector

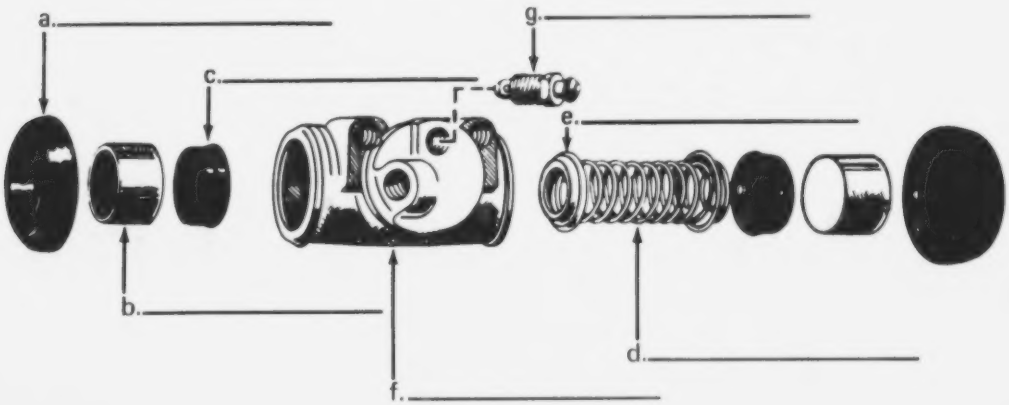
_____k. Primary piston assembly

_____l. Master cylinder

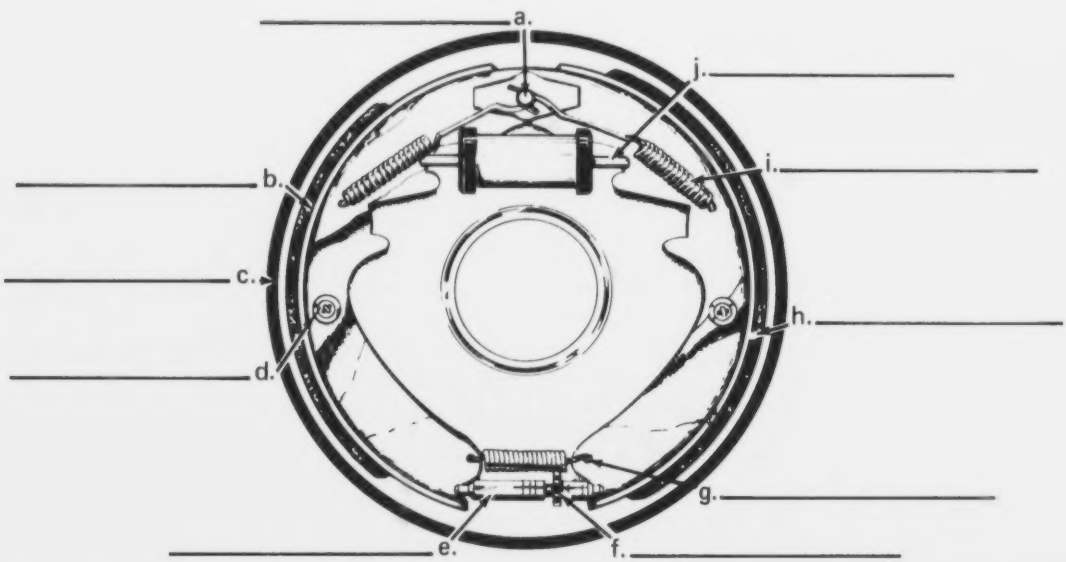
_____m. Piston stop bolt

_____n. Snap ring

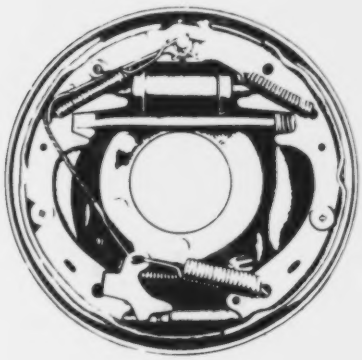
7. Identify the parts of the wheel cylinder in the diagram below by writing the correct names in the blanks provided.



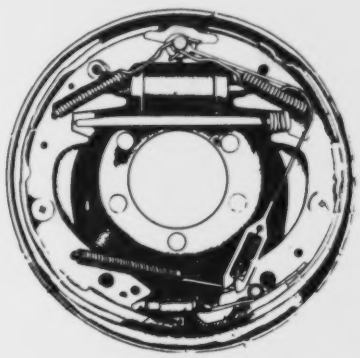
8. Identify the parts of the standard brake assembly in the diagram below by writing the correct names in the blanks provided.



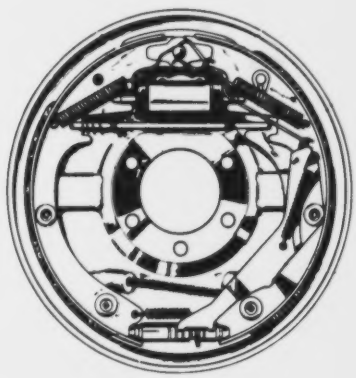
9. Identify the types of self-adjusting brake systems in the diagrams below by writing the correct names in the blanks provided.



a. _____



b. _____



c. _____

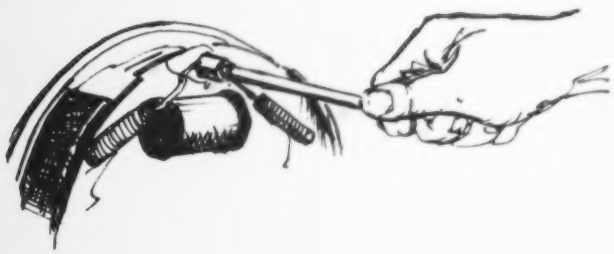
10. Describe brake operation.

a. As the brake pedal is depressed,

b. As the brake pedal is released,

11. Briefly explain what is being done in each of the following illustrations.

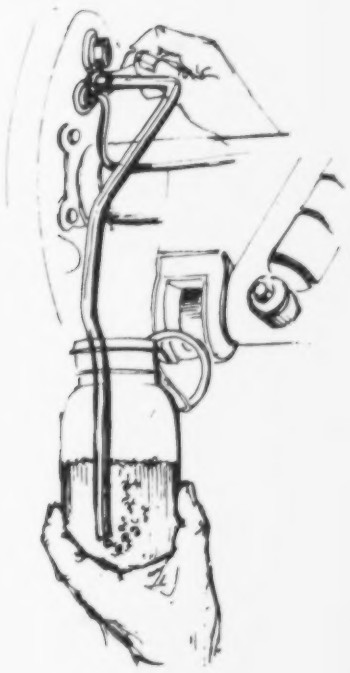
a.



_____

_____

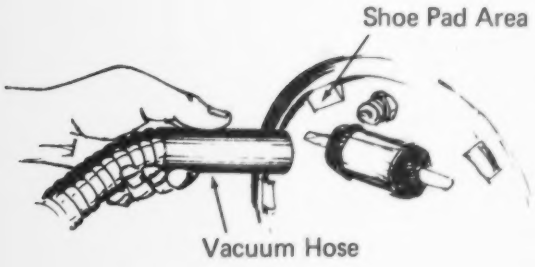
b.



_____

_____

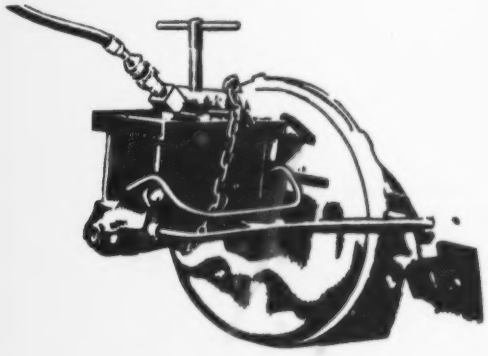
c.



_____

_____

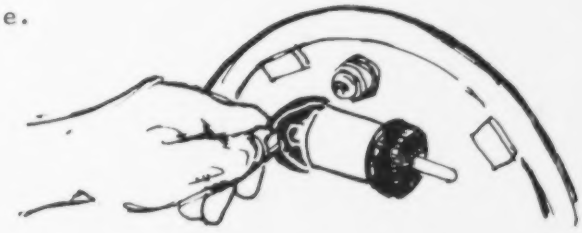
d.



_____

_____

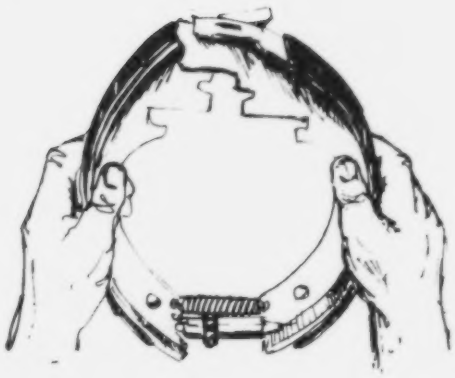
e.



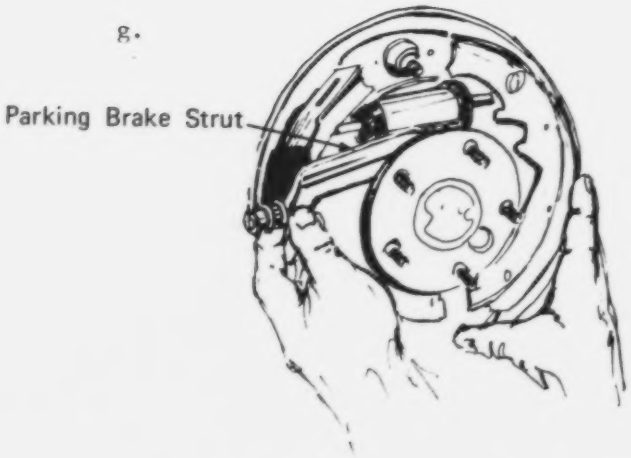
_____

_____

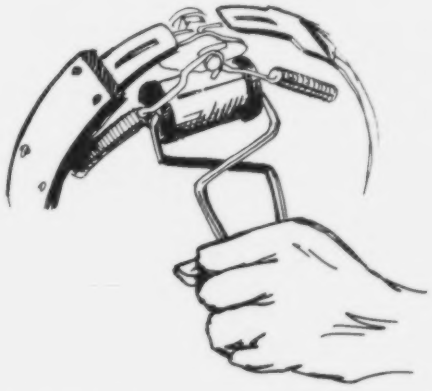
f.



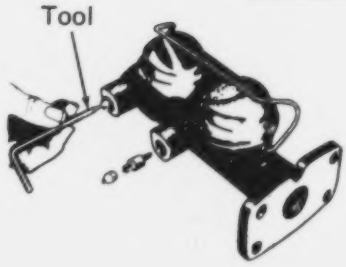
g.



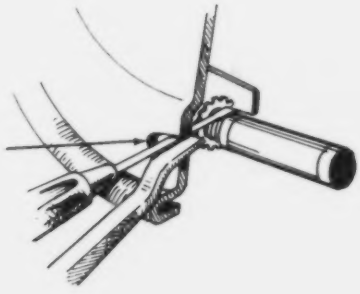
h.



i.



j.



12. Stop. Have your instructor evaluate your test and mark the areas below which require additional study.

Refer to Information Sheet, Sections:

_____I	_____VI
_____II	_____VII
_____III	_____VIII
_____IV	_____IX
_____V	_____X

You came here from LAP Step 2. If any of the above study areas is checked, continue to LAP Step 3. Otherwise, proceed to LAP Step 6.

BRAKE SYSTEMS

UNIT I

LAP ASSIGNMENT SHEET #1--BRAKE SYSTEM

NAME_____ SCORE_____

1. Write the purpose of the brake system by completing the following statement:

   The brake system provides a method of _____ or _____ the car by the driver.

2. Match these terms associated with the brake system to the correct definition by choosing the definition which best identifies the term.

   a. Brake fluid:

      _____1) Special fluid used in hydraulic brake systems.

      _____2) Refers to fluid in motion.

      _____3) Cylinder that produces or is controlled by the motion of fluid.

   b. Hydraulic:

      _____1) Refers to the removal of air from the brake system.

      _____2) Refers to fluid in motion.

      _____3) That part of the brake assembly to which the brake lining is attached.

   c. Hydraulic cylinder:

      _____1) Cylinder that produces or is controlled by the motion of fluid.

      _____2) High pressure line used to carry the brake fluid from the master cylinder to the wheel cylinder.

      _____3) That part of the brake assembly to which the brake lining is attached.

   d. Bleeding the brakes:

      _____1) Refers to the removal of air from the hydraulic brake system.

      _____2) Special fluid used in hydraulic brake systems.

      _____3) Refers to fluid in motion.

e. Wheel cylinder:

_____1) Cast iron or aluminum housing that rotates around the brake assembly providing a smooth surface for the brake shoes to contact and exert braking action.

_____2) Hydraulic cylinder used to force the brake fluid to the individual wheel cylinders when applying the brakes.

_____3) Hydraulic cylinder which is actuated by hydraulic pressure to force the brake lining into contact with the brake drum.

f. Brake drums:

_____1) High pressure line used to carry the brake fluid from the master cylinder to the wheel cylinders.

_____2) That part of the brake assembly to which the brake lining is attached.

_____3) Cast iron or aluminum housing that rotates around the brake assembly providing a smooth surface for the brake shoes to contact and exert braking action.

g. Brake shoe:

_____1) Special fluid used in hydraulic brake systems.

_____2) That part of the brake assembly to which the brake lining is attached.

_____3) Cast iron or aluminum housing that rotates around the brake assembly providing a smooth surface for the brake shoes to contact and exert braking action.

h. Brake line:

_____1) Refers to fluid in motion.

_____2) High pressure line used to carry the brake fluid from the master cylinder to the wheel cylinders.

_____3) That part of the brake assembly to which the brake lining is attached.

i. Master cylinder:

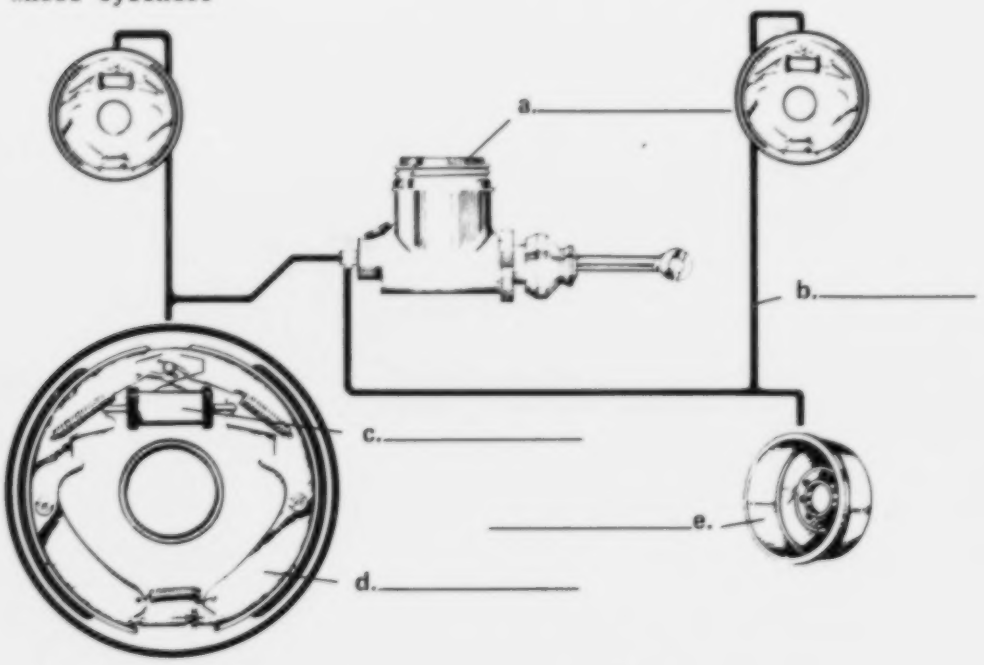
_____1) Hydraulic cylinder used to force the brake fluid to the individual wheel cylinders when applying the brakes.

_____2) Hydraulic cylinder which is actuated by hydraulic pressure to force the brake lining into contact with the brake drum.

_____3) Special fluid used in hydraulic brake systems.

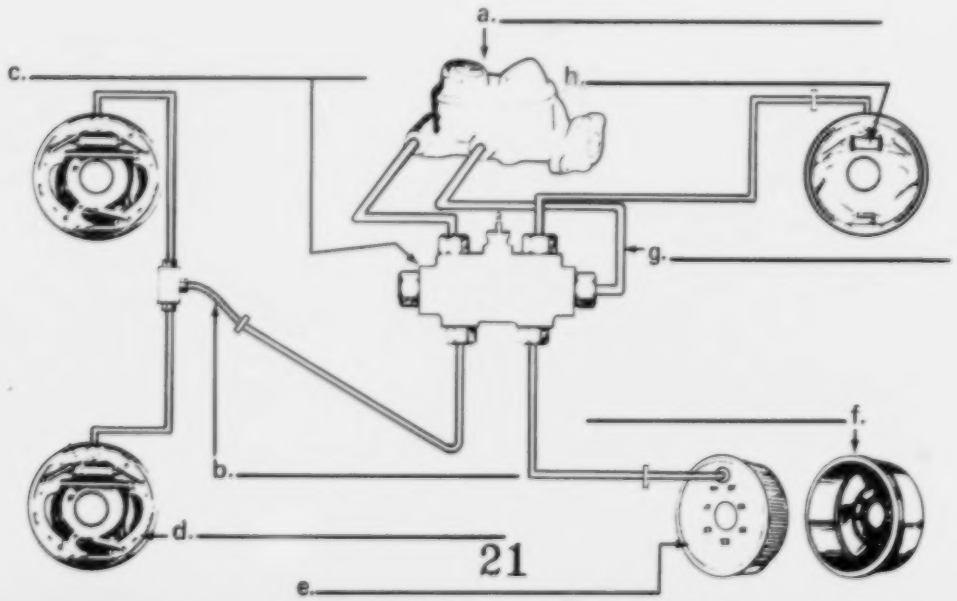
3. Identify the components of the standard brake system in the diagram below by writing the correct names in the blanks provided from the list below.

Master cylinder
Brake line
Wheel Cylinder
Brake Shoe
Brake drum

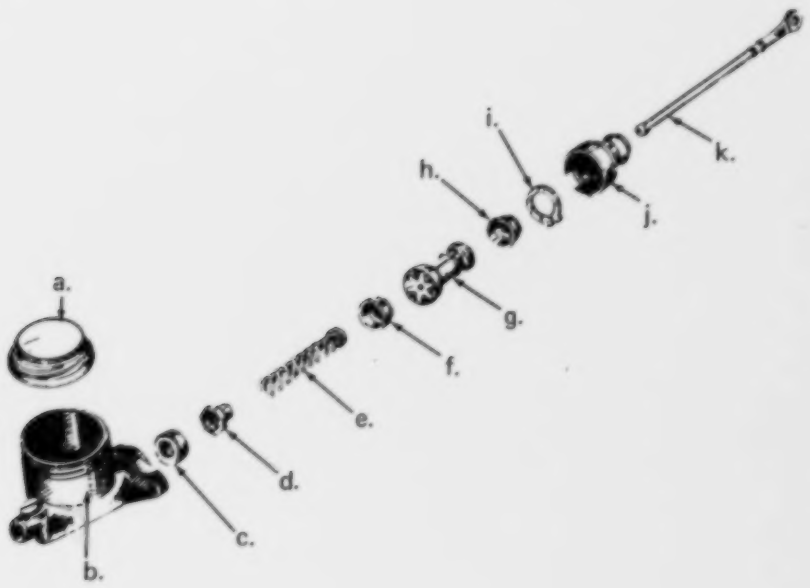


4. Identify the components of the tandem or dual brake system in the diagram by writing the correct names in the blanks provided from the list below.

Tandem or dual master cylinder
Brake flex hose
Brake shoe
Pressure differential valve and brake warning light switch
Backing plate
Brake drum
Brake line
Wheel cylinder



5. Identify the parts of the standard master cylinder by matching the correct component names with the letters which label the parts in the diagram below.



a. _____

b. _____

c. _____

d. _____

e. _____

f. _____

g. _____

h. _____

i. _____

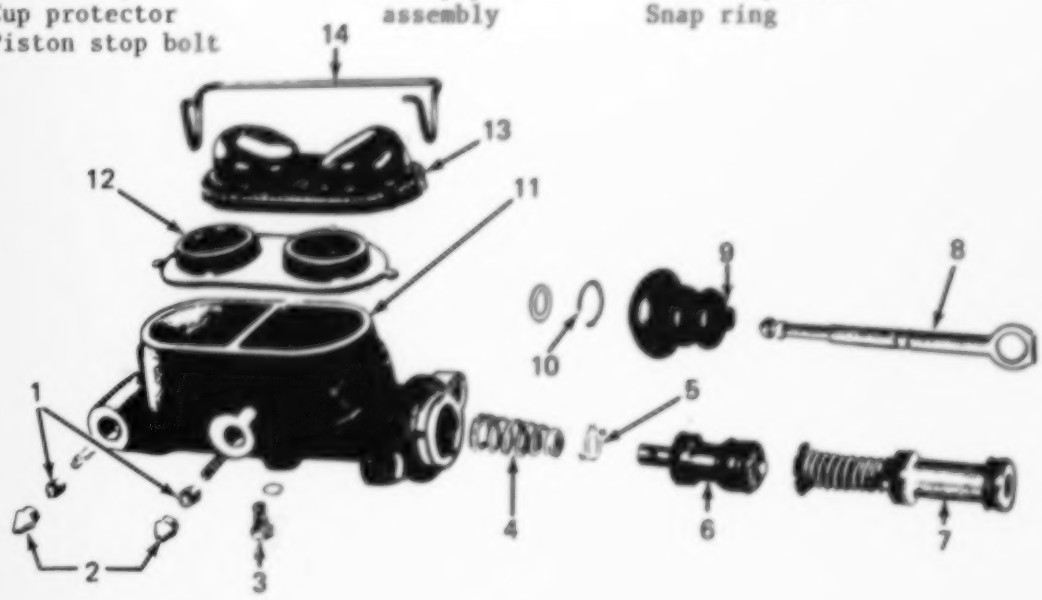
j. _____

k. _____

1. Piston return spring
2. Fluid reservoir
3. Secondary Cup
4. Push rod
5. Filler cap
6. Piston
7. Residual pressure check valve assembly
8. Piston lock ring
9. Boot
10. Rubber valve seat washer
11. Primary cup

6. Identify the parts of the tandem master cylinder in the diagram by matching the correct name with the numbered blanks below.

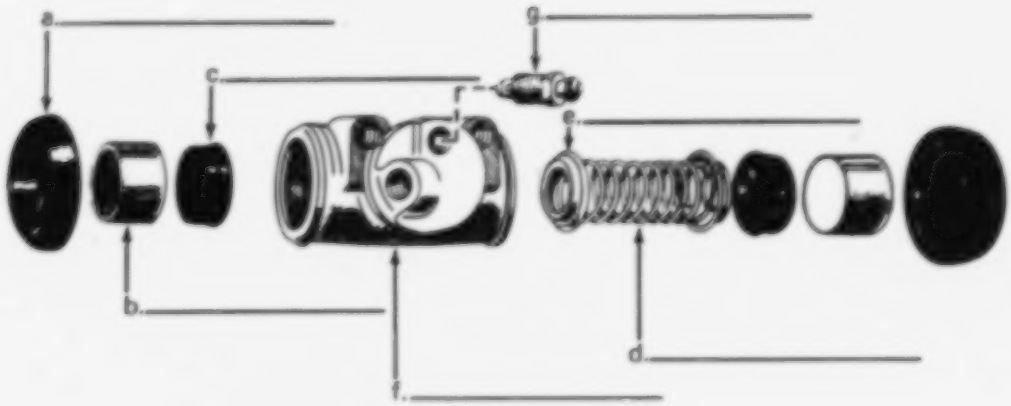
Push rod	Cover	Residual pressure check valve
Diaphragm	Tube seat	Return spring
Secondary piston assembly	Retainer bail	Boot
Cup protector	Primary piston assembly	Master cylinder
Piston stop bolt		Snap ring



1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____

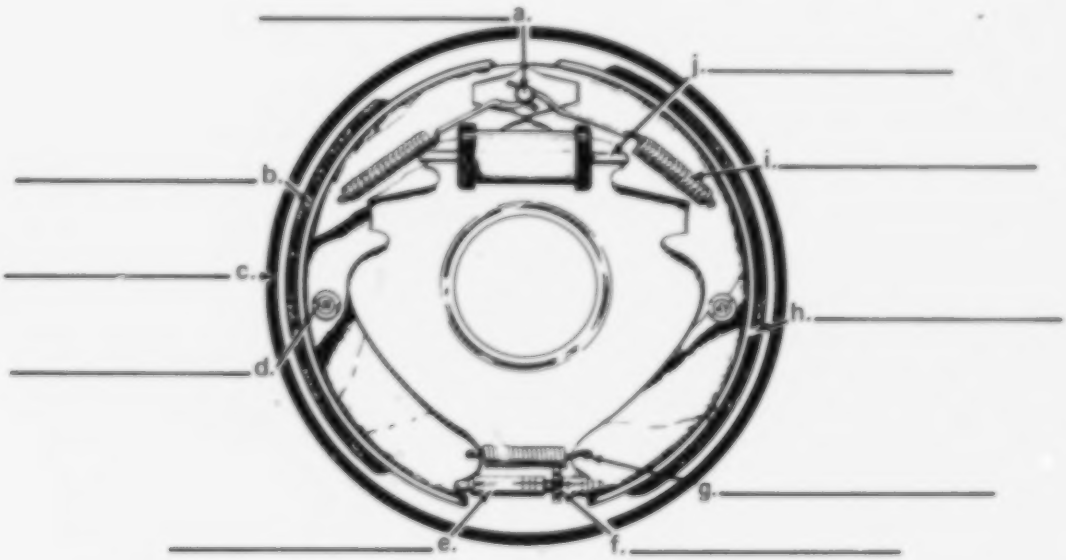
7. Identify the parts of the wheel cylinder in the diagram by writing the correct names in the blanks provided from the list below.

Bleeder screw
Cup expander
Expander
Boot
Spring
Piston
Cylinder



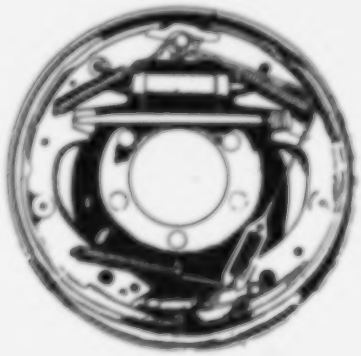
8. Identify the parts of the standard brake assembly in the diagram by writing the correct names in the blanks provided from the list below.

Backing plate
Secondary brake shoe and lining
Anchor pin
Adjusting screw spring
Adjusting screw
Star wheel
Connecting link
Primary brake shoe and lining
Return spring
Brake shoes retainer

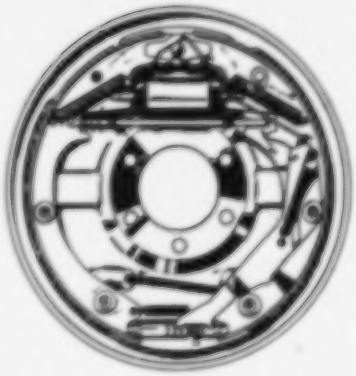


9. Identify the types of self-adjusting brake systems by matching the correct name with the diagram of the system.

Cable pull, early type Cable pull, late type Lever type



a. _____



b. _____

c. _____

10. Describe the operation of the brake system by telling what happens with the components listed.

    a. As the brake pedal is depressed,

        1) The master cylinder

        2) Brake fluid

        3) Wheel cylinders

        4) The brake shoe and lining

        5) Contact between the brake lining and drum

    b. As the brake pedal is released, the return springs

11. Stop. Have your instructor evaluate your Assignment Sheet and mark the areas below which require additional study.

    Refer to Information Sheet, Sections:

_____I	_____VI
_____II	_____VII
_____III	_____VIII
_____IV	_____IX
_____V	_____X

    If none of the above study areas is checked, proceed to LAP Step 6. Otherwise, study the required sections and then continue to LAP Step 5.

BRAKE SYSTEMS
UNIT I

LAP ASSIGNMENT SHEET #2--BRAKE SYSTEM

NAME _____ SCORE _____

1. Write the purpose of the brake system.

_____

_____

2. Define these terms associated with the brake system.

a. Brake line: _____

_____

b. Brake shoe: _____

_____

c. Brake drum: _____

_____

d. Master cylinder: _____

_____

e. Wheel cylinder: _____

_____

f. Bleeding the brakes: _____

_____

g. Hydraulic cylinder: _____

_____

h. Hydraulic: _____

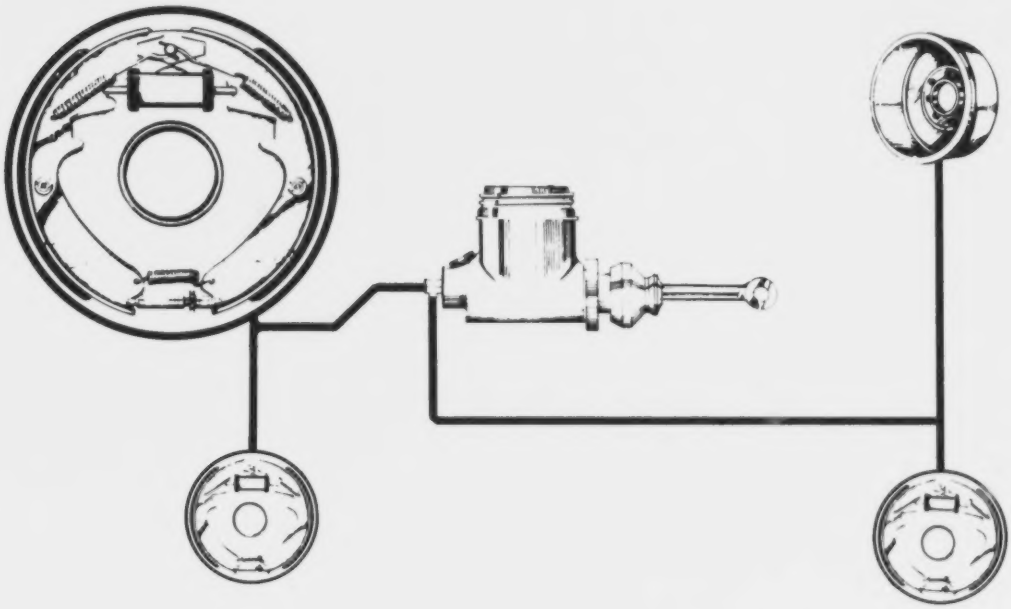
_____

i. Brake fluid: _____

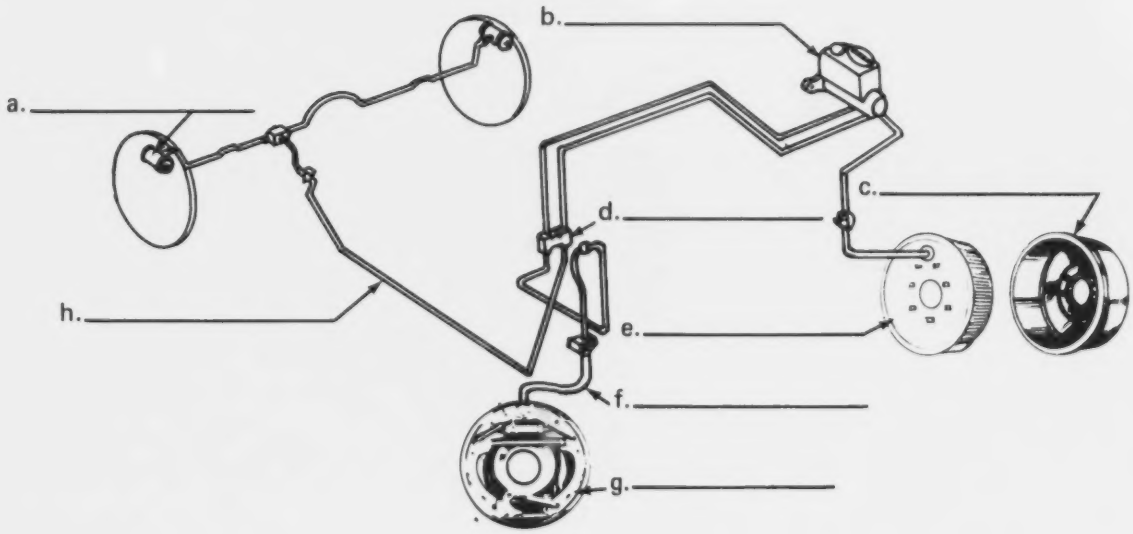
_____

3. Identify the components of the standard brake system in this diagram by drawing a line from the correct name to the component.

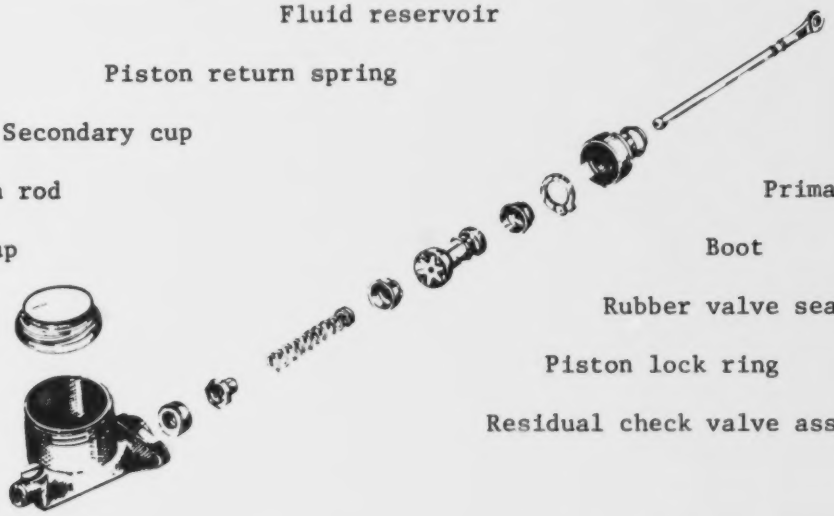
Brake shoe Master cylinder Brake line Brake drum Wheel cylinder



4. Identify the components of the tandem or dual brake system in the diagram below.



5. Identify the parts of the standard master cylinder by drawing a line from the name to the correct part.



Fluid reservoir

Piston return spring

Secondary cup

Push rod

Filler cap

Piston

Primary cup

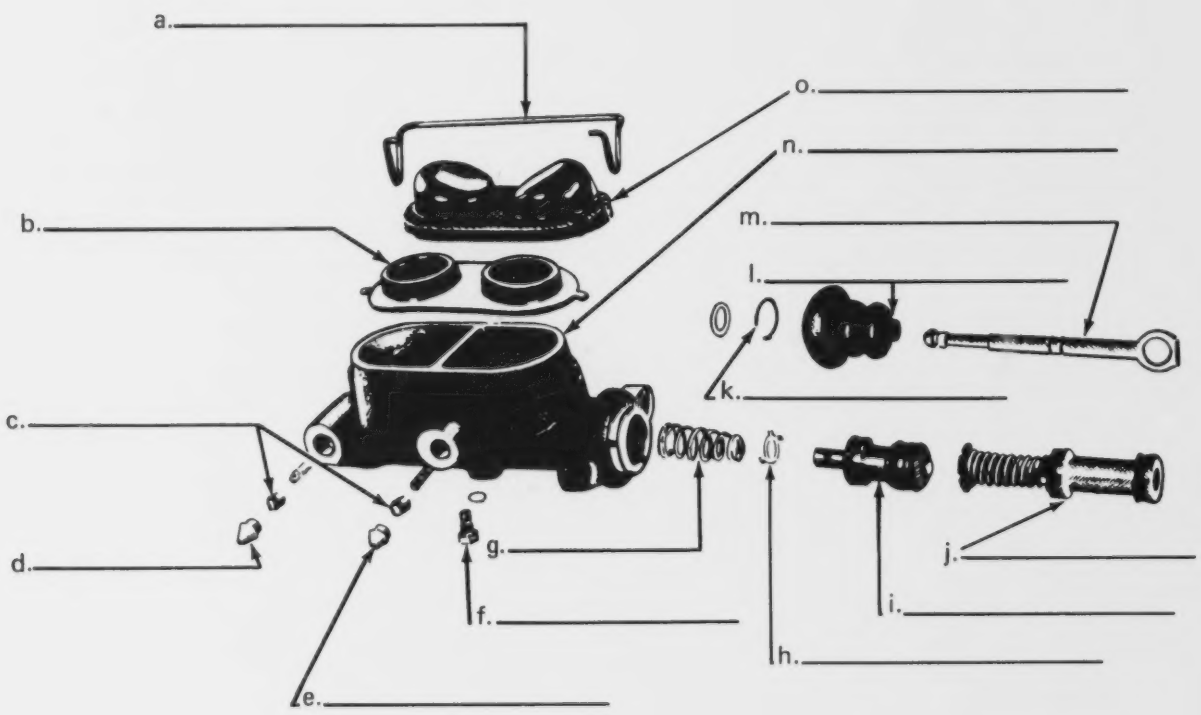
Boot

Rubber valve seat washer

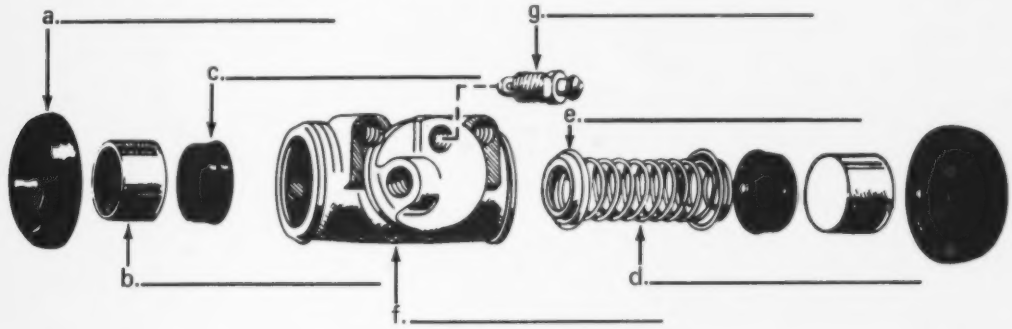
Piston lock ring

Residual check valve assembly

6. Identify the parts of the tandem master cylinder in the diagram below by writing the correct number beside the name of the part.



7. Identify the parts of the wheel cylinder in the diagram by writing the correct names of the numbered parts in the blanks provided.



1. _____ 6. _____

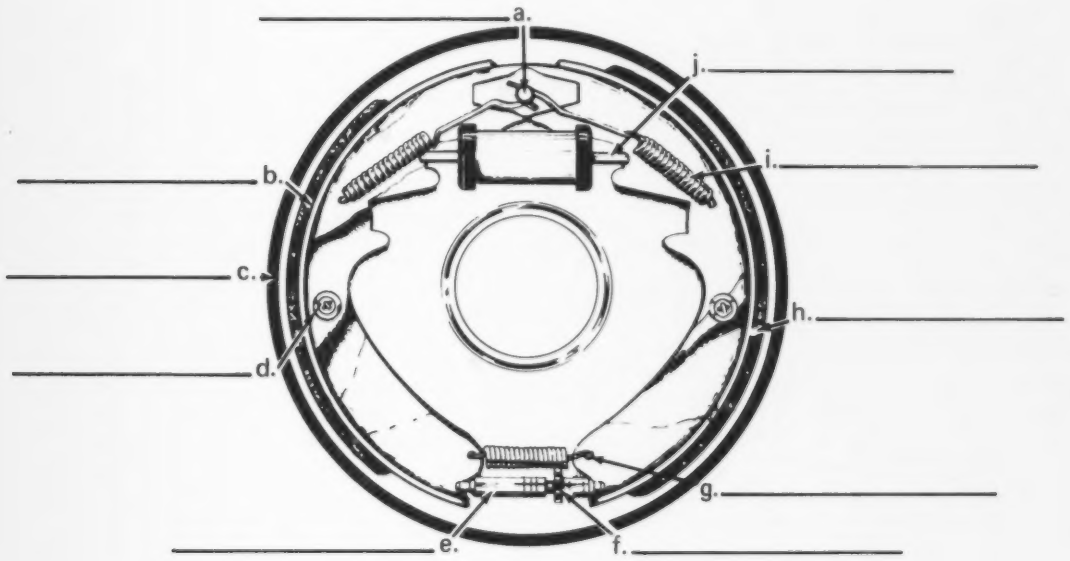
2. _____ 7. _____

3. _____ 8. _____

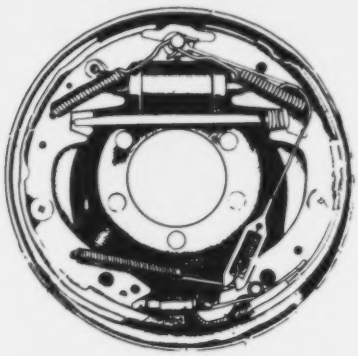
4. _____ 9. _____

5. _____

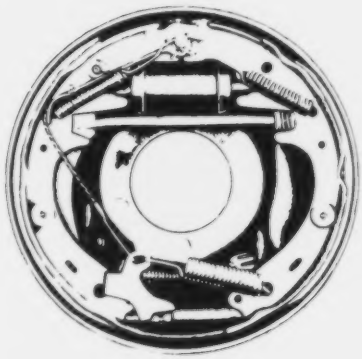
8. Identify the parts of the standard brake assembly in the diagram below by writing the correct names in the blanks provided.



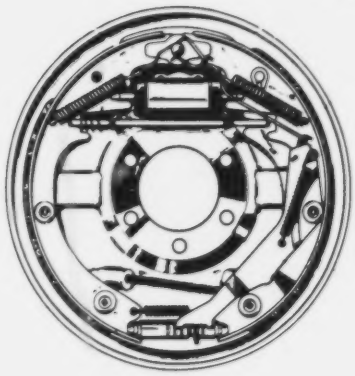
9. Identify the types of self-adjusting brake system in the diagrams below by writing the correct names in the blanks provided.



a. _____



b. _____



c. _____

10. Describe the operation of the brake system.

a. As the brake pedal is depressed,

b. As the brake pedal is released,

11. Stop. Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your progress, continue to LAP Step 6. If additional study is required, discuss a study program with your instructor. Once you have completed that program to your instructor's satisifaction, continue to LAP Step 6.

State Department of Vocational and Technical Education CIMC Stillwater, Oklahoma LEARNING ACTIVITY PACKETS

for AUTO MECHANICS I

LAP NO._____ CODE:_____

MAJOR INSTRUCTIONAL AREA

BRAKE SYSTEM

INSTRUCTIONAL UNIT

POWER DISC BRAKES
SECTION E--UNIT II

LEARNING ACTIVITY PACKET NO.

23

PREREQUISITE LAP(S)

1, 2, 16 18, 22

PURPOSE: This Learning Activity Packet (LAP) outlines the study activities for "Power Disc Brakes." Accomplishing these procedures will aid the student in attaining a working knowledge of this area of training and in achieving a SKILLED or MODERATELY SKILLED competency level in the performance of jobs associated with this specialty.

INTRODUCTION: The course of study in this LAP will help the student become able to identify the components of the various disc brake systems and match components to their functions. The student should further become able to discuss the operation of each type of power booster and to demonstrate the ability to test and repair a disc brake system.

TASKS INCLUDED IN THIS LAP:

1. Test the hydraulic system.
2. Test the vacuum power booster.
3. Repair a sliding caliper disc brake.
4. Check disc runout and thickness.

AUTO MECHANICS I
POWER DISC BRAKES

SECTION E--UNIT II

LEARNING STEPS

Check the Following
Blanks as You Complete
Each Required Step.

_____1. Read Unit and Specific Objectives, page 81-E.

_____2. Complete Power Disc Brakes Pre-Test, LAP page 5.

_____3. Study The sections of the Information Sheet, pages 85-E through 113-E, indicated by your instructor on your Pre-Test. Be sure to study the transparency masters when required.

_____4. Do LAP Assignment Sheet #1, LAP page 15.

_____5. Do LAP Assignment Sheet #2, LAP page 27.

_____6. Check The tasks below which you feel that you can perform without supervision.

Student Check		Instructor Initials/Date	
		Skilled	Moderately Skilled
_____a.	Test the hydraulic system (9).	_____	_____
_____b.	Test the vacuum power booster (15).	_____	_____
_____c.	Repair a sliding caliper disc brake (21).	_____	_____
_____d.	Check disc runout and thickness (27).	_____	_____

_____7. Discuss Your competency in each task with your instructor. Your instructor will initial each task in which you demonstrate sufficient competency. If all tasks have been initialed, proceed to Step 33. Otherwise, continue to Step 8.

_____8. Refer To Step 6a. If this task has been initialed, proceed to Step 14. Otherwise, continue to Step 9.

_____9. Study Job Sheet #1--Test the Hydraulic System, page 115-E.

_____10. Watch Slide/Tape presentation "Test the Hydraulic System" (E-II-1).

_____11. Do Job Sheet #1--Test the Hydraulic System.

_____12. Stop. Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 6a and proceed to Step 14. Otherwise, repeat Steps 9-11 and then go to Step 13.

_____13. Stop. Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 6a and continue to Step 14. If additional study is required, discuss a program to help you attain sufficient competency with your instructor. Once you have completed that program to your instructor's satisfaction, have your instructor initial Step 6a and continue to Step 14.

_____14. Refer To Step 6b. If this task has been initialed, proceed to Step 20. Otherwise, continue to Step 15.

_____15. Study Job Sheet #2--Test the Vacuum Power Booster, page 117-E.

_____16. Watch Slide/Tape presentation "Test the Vacuum Power Booster" (E-II-2).

_____17. Do — Job Sheet #2--Test the Vacuum Power Booster.

_____18. Stop. — Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 6b and proceed to Step 20. Otherwise, repeat Steps 15-17 and then go to Step 19.

_____19. Stop. — Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 6b and continue to Step 20. If additional study is required, discuss a program to help you attain sufficient competency with your instructor. Once you have completed that program to your instructor's satsifaction, have your instructor initial Step 6b and continue to Step 20.

_____20. Refer — To Step 6c. If this task has been initialed, proceed to Step 26. Otherwise, continue to Step 21.

_____21. Study — Job Sheet #3--Repair a Sliding Caliper Disc Brake, page 121-E.

_____22. Watch — Slide/Tape presentation "Repair a Sliding Caliper Disc Brake" (E-II-3).

_____23. Do — Job Sheet #3--Repair a Sliding Caliper Disc Brake.

_____24. Stop. — Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 6c and proceed to Step 26. Otherwise, repeat Steps 21-23 and then go to Step 25.

_____25. Stop. — Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 6c and continue to Step 26. If additional study is required, discuss a program to help you attain sufficient competency with your instructor. Once you have completed that program to your instructor's satisfaction, have your instructor initial Step 6c and continue to Step 26.

_____26. Refer — To Step 6d. If this task has been initialed, proceed to Step 32. Otherwise, continue to Step 27.

_____27. Study — Job Sheet #4--Check Disc Runout and Thickness, page 129-E.

_____28. Watch — Slide/Tape presentation "Check Disc Runout and Thickness" (E-II-4).

_____29. Do — Job Sheet #4--Check Disc Runout and Thickness.

_____30. Stop. — Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 6d and proceed to Step 32. Otherwise, repeat Steps 27-29 and then go to Step 31.

_____31. Stop. — Have your instructor evaluate your work. If you achieve a SKILLED or MODERATELY SKILLED rating, have your instructor initial Step 6d and continue to Step 32. If additional study is required, discuss a program to help you attain sufficient competency with your instructor. Once you have completed that program to your instructor's satisfaction, have your instructor initial Step 6d and continue to Step 32.

_____32. Refer — To Step 6. If all tasks have been initialed, continue to Step 33. Otherwise, refer to the step indicated in parentheses after the unsigned task.

_____33. Review — Information Sheet (page 85-E).

_____34. Take — Power Disc Brake Unit II Test (see your instructor).

_____35. Stop. — This concludes the Auto Mechanics I course of study. Take your completed LAPs to your instructor and discuss your performance and other areas of study.

POWER DISC BRAKES
UNIT II

PRE-TEST

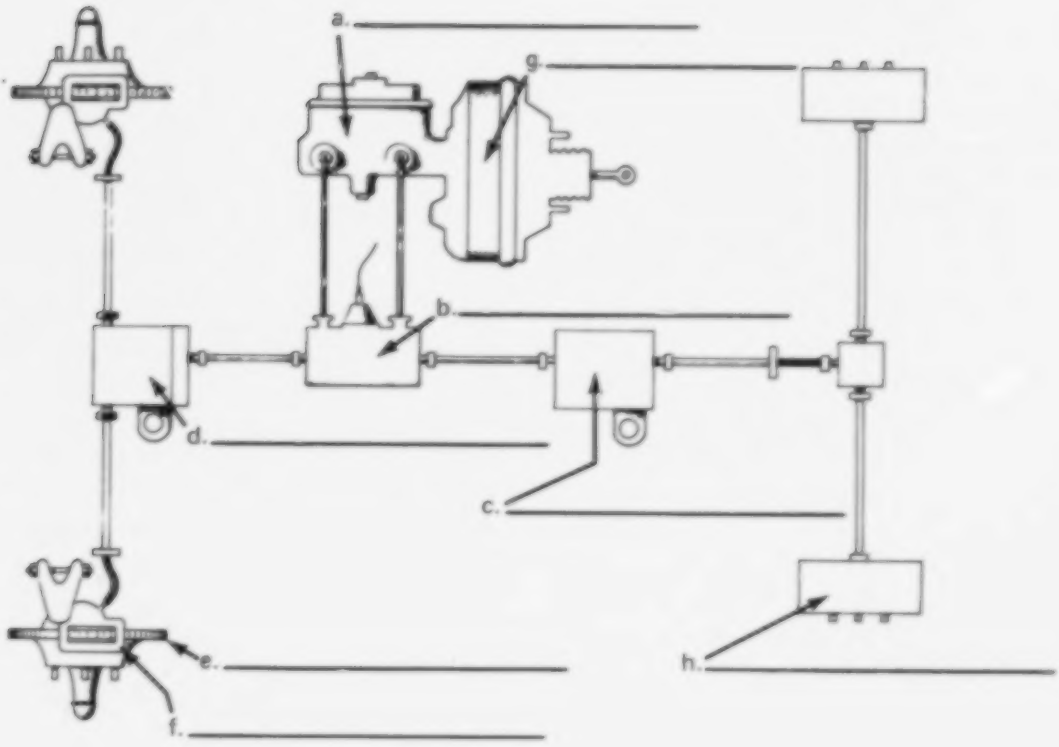
NAME_____ SCORE_____

DIRECTIONS: This test is to determine how much you already know about power disc brakes. Your performance on this test will not be used to determine your grade in the course. Instead, it will guide your instructor in designing this course to meet your needs. Answer only those questions for which you know the answer. Guessing may prevent you from receiving the lessons which are required.

1. Match the terms on the right to the correct definitions.

_____a.	Brake system utilizing a caliper which compresses brake shoes against a circular disc	1. Hydro-boost
_____b.	Condition caused by heat or moisture that decreases friction and the braking power of the system	2. Power booster
_____c.	Larger action that results from a smaller input action	3. Disc brakes
_____d.	Vacuum or hydraulic operated unit that is designed to assist the driver when applying the brakes	4. Friction
_____e.	Resistance to relative movement between two bodies in contact	5. Inboard shoe
_____f.	Power assistant unit operated by hydraulic pressure from the power steering pump	6. Manifold vacuum
_____g.	Pressure lower than atmospheric pressure developed in the engine intake manifold and cylinders by the movement of the pistons in the cylinders	7. DOT
_____h.	Shoe next to the single piston in the cliper and on the vehicle frame side of the brake disc	8. Brake fade
_____i.	Shoe opposite the caliper piston and outside the brake disc	9. Servo action
_____j.	Department of Transportation; federal government agency whose function is to set standards for safety items on motor vehicles	10. Outboard shoe

2. Identify the major components of the disc brake system in the illustration below.



3. Match the disc brake system components on the right to the correct functions.

_____a.	Regulates the hydraulic pressure to the front disc brakes in the 3 to 135 psi range to allow the rear drum brake shoes to begin brake action to prevent locking of the front brakes, especially on icy or slick surfaces.	1. Pressure differential valve
_____b.	Senses unbalanced pressure between the front and rear brake systems and causes the warning light to shine.	2. Master cylinder
_____c.	Contains friction linings and a hydraulic piston to supply force on the linings to stop the rotor.	3. Disc or rotor assembly
_____d.	Forces brake fluid into all wheel cylinders when brakes are applied.	4. Metering valve
_____e.	Assists the driver in applying the brakes.	5. Proportioning valve
_____f.	Regulates rear brake system hydraulic pressure to prevent premature rear wheel skid on emergency stops.	6. Power booster unit
_____g.	Provides a friction surface for the lining to exert a force resisting the rotation of the wheel.	7. Caliper assembly

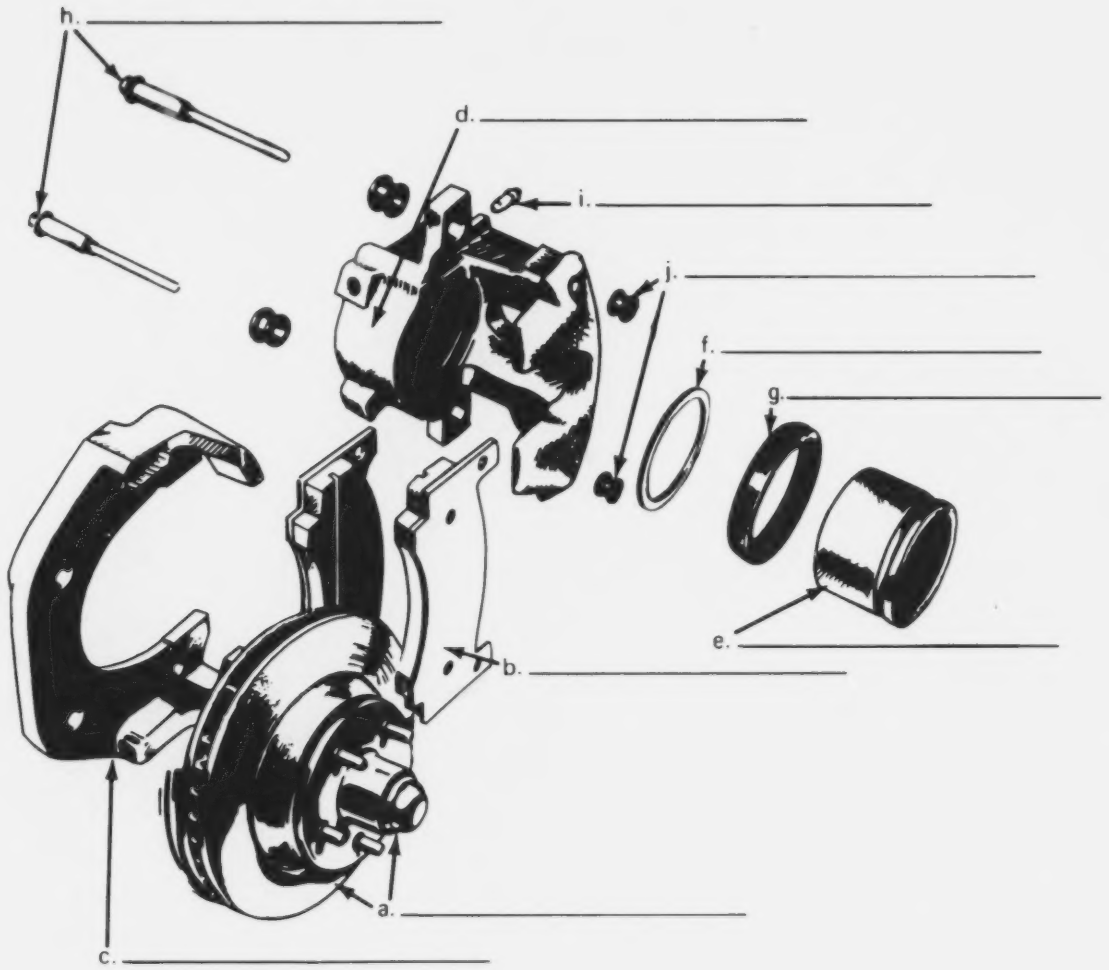
4. List the three types of disc brake calipers.

a.

b.

c.

5. Identify the parts of the floating caliper disc brake in the illustration below.



6. List good characteristics of disc brakes.

   a.

   b.

   c.

   d.

   e.

7. Discuss reasons disc brakes may require power booster units.

8. List two sources of energy used for power boosters.

   a.

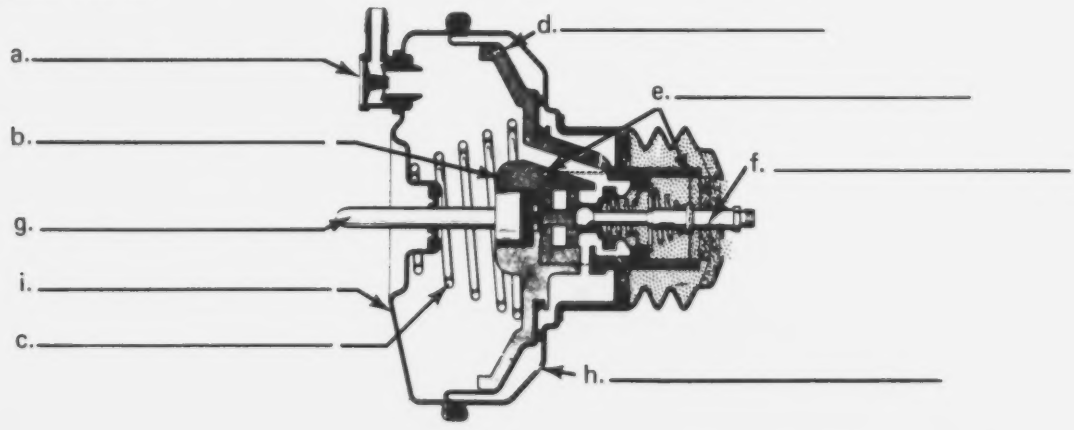
   b.

9. List two types of vacuum operated power boosters.

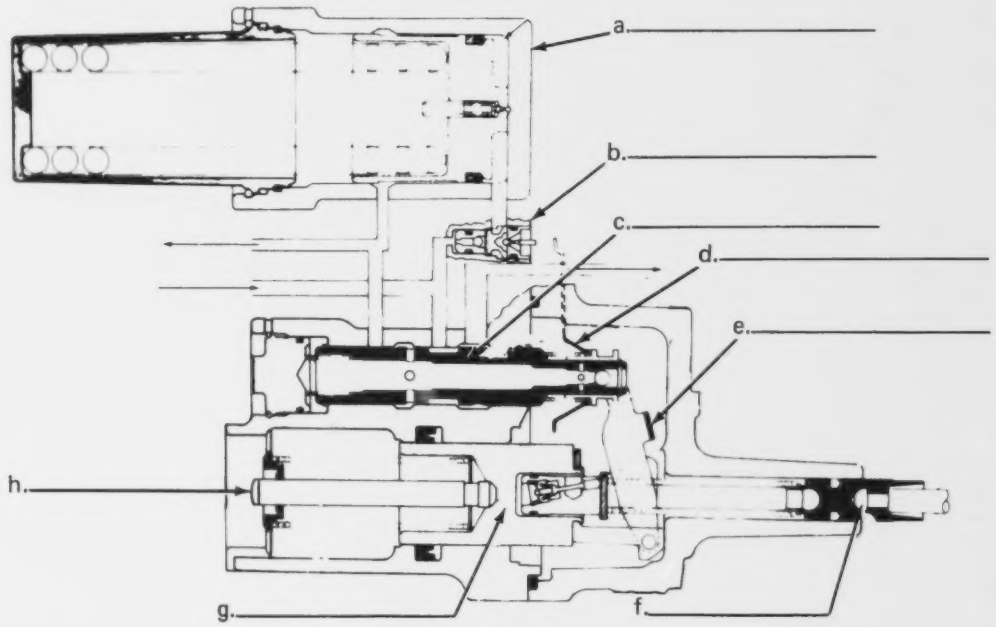
   a.

   b.

10. Identify the parts of the vacuum operated power booster in the illustration below.



11. Identify the major parts of the hydro-boost power booster in the illustration below.



12. Discuss briefly the operation of the vacuum suspended power booster.

13. Discuss briefly the operation of the atmospheric suspended power booster.

14. Discuss briefly the operation of the hydro-boost power booster.

15. List six requirements of super heavy-duty brake fluid.

a.

b.

c.

d.

e.

f.

16. Discuss conditions that are considered normal and are not indications that master cylinder needs service.

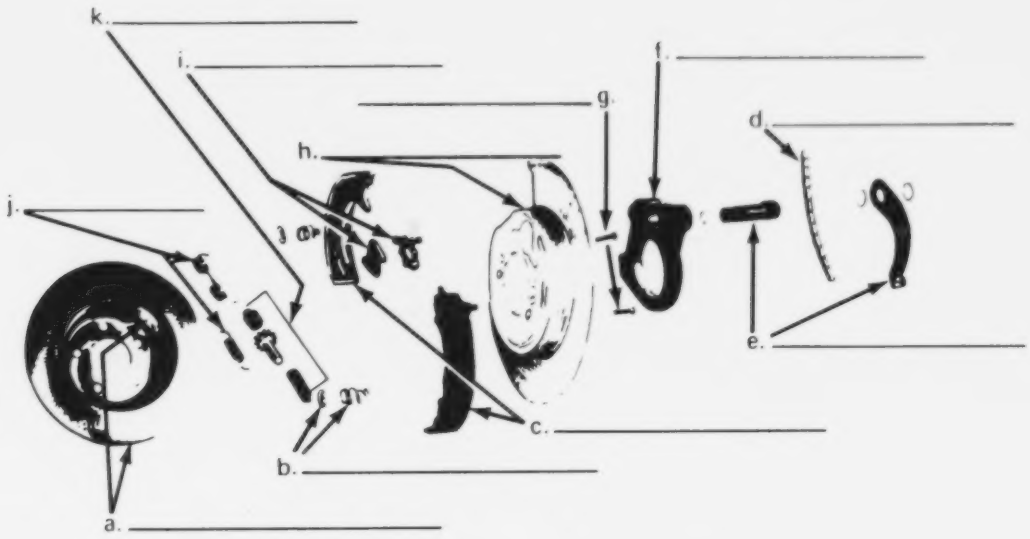
a. Unequal brake fluid levels in master cylinder reservoir--

b. Momentary or slight squirt of brake fluid from one or both master cylinder reservoir chambers upon application of the brake pedal--

c. Slight turbulence in reservoir fluid occuring when the brake pedal is released--

d. A trace of brake fluid on the power booster housing below the master cylinder mounting flange--

17. Identify the parts of the parking brake system on the four wheel disc brake in the illustration below.



18. Stop. Have your instructor evaluate your test and mark the areas below which require additional study.

Refer to Information Sheet, Sections:

I_____	X_____
II_____	XI_____
III_____	XII_____
IV_____	XIII_____
V_____	XIV_____
VI_____	XV_____
VII_____	XVI_____
VIII_____	XVII_____
IX_____	

You came here from LAP Step 2. If none of the above areas are checked, proceed to Step 6. Otherwise, continue to Step 3.

BRAKE SYSTEMS
UNIT II

LAP ASSIGNMENT SHEET #1--POWER DISC BRAKES

NAME_____ SCORE_____

1. Match these terms associated with power disc brakes to the correct definition by choosing the definition which best identifies the term.

   1. Outboard shoe:

      _____a. Power assist unit operated by hydraulic pressure from the power steering pump.

      _____b. Shoe next to the single piston in the caliper and on the vehicle frame side of the brake disc.

      _____c. Shoe opposite the caliper piston and outside the brake disc.

   2. Servo action:

      _____a. Condition caused by heat or moisture that decreases friction and the braking power of the system.

      _____b. Larger action that results from a smaller input action.

      _____c. Resistance to relative movement between two bodies in contact.

   3. Brake fade:

      _____a. Condition caused by heat or moisture that decreases friction and the braking power of the system.

      _____b. Larger action that results from a smaller input action.

      _____c. Pressure lower than atmospheric pressure developed in the engine intake manifold and cylinders by the movement of the piston in the cylinders.

   4. DOT:

      _____a. Brake system utilizing a caliper which compresses brake shoes against a circular disc.

      _____b. Vacuum or hydraulic operated unit that is designed to assist the driver when applying the brakes.

      _____c. Department of Transportation; federal government agency whose function is to set standards for safety items on motor vehicles.

5. Manifold vacuum:

_____a. Condition caused by heat or moisture that decreases friction and the braking power of the system.

_____b. Vacuum or hydraulic operated unit that is designed to assist the driver when applying the brakes.

_____c. Pressure lower than atmospheric pressure developed in the engine intake manifold and cylinders by movement of the pistons in the cylinders.

6. Inboard shoe:

_____a. Shoe next to the single piston in the caliper and on the vehicle frame side of the brake disc.

_____b. Shoe opposite the caliper piston and outside the brake disc.

_____c. Department of Transportation; federal government agency whose function is to set standards for safety items on motor vehicles.

7. Friction:

_____a. Condition caused by heat or moisture that decreases friction and the braking power of the system.

_____b. Resistance to relative movement between two bodies in contact.

_____c. Vacuum or hydraulic operated unit that is designed to assist the driver when applying the brakes.

9. Power-booster:

_____a. Larger action that results from a smaller input action.

_____b. Vacuum or hydraulic operated unit that is designed to assist the driver when applying the brakes.

_____c. Power assist unit operated by hydraulic pressure from the power steering pump.

10. Hydro-boost:

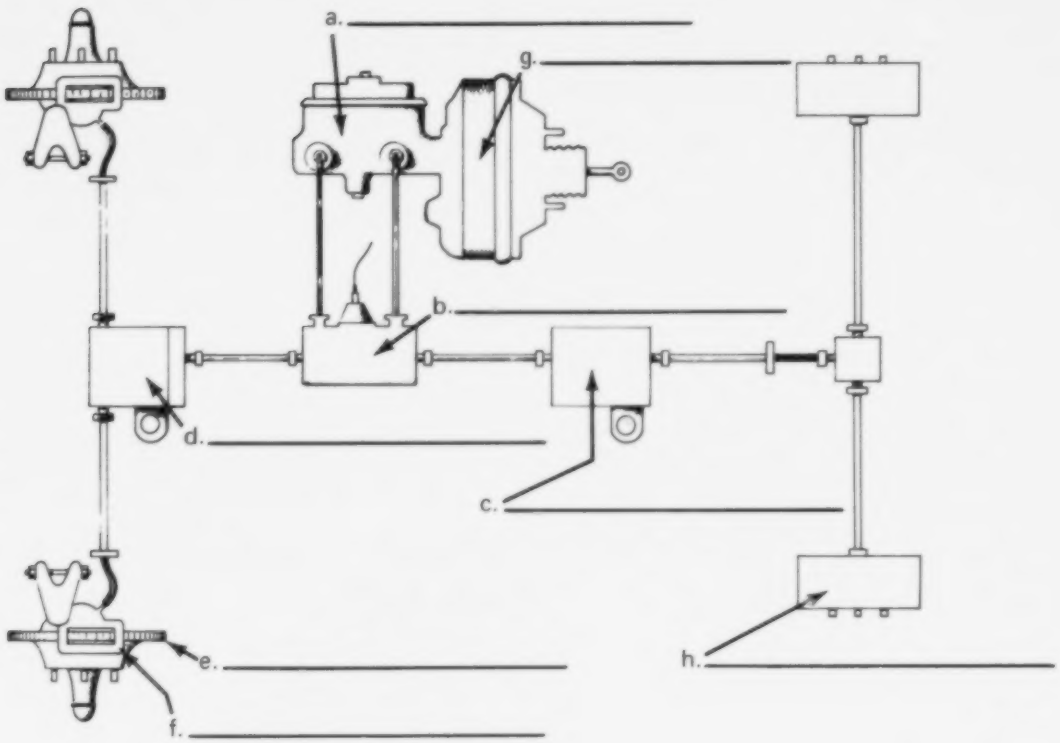
_____a. Larger action that results from a smaller input action.

_____b. Vacuum or hydraulic operated unit that is designed to assist the driver when applying the brakes.

_____c. Power assist unit operated by hydraulic pressure from the power steering pump.

2. Identify the major components of the disc brake system by labeling the illustration with the terms below.

Metering valve	Rear drum or disc brake assembly
Power booster unit	Front disc or rotor assembly
Master cylinder	Caliper assembly
Proportioning valve	Pressure differential valve



3. Match the disc brake system components to their correct function by choosing from the following terms to complete the sentences below.

Pressure differential valve	Master cylinder
Proportioning valve	Metering valve
Caliper assembly	Disc or rotor assembly
Power booster unit	

a. The _____ _____ regulates the hydraulic pressure to the front disc brakes in the 3 to 135 psi range to allow the rear drum brake shoes to begin brake action to prevent locking of the front brakes especially on icy or slick surfaces.

b. The _____ _____ assists the driver in applying the brakes.

c. The _____ _____ regulates rear brake system hydraulic pressure to prevent premature rear wheel skid on emergency stops.

d. The _____ _____ senses unbalanced pressure between the front and rear brake systems and causes the warning light to shine.

e. The _____ _____ _____ _____ provides a friction surface for the lining to exert a force resisting the rotation of the wheel.

f. The _____ _____ contains friction linings and a hydraulic piston to supply force on the linings to stop the rotor.

g. The _____ _____ forces brake fluid into all wheel cylinders when the brakes are applied.

4. List the three types of disc brake calipers by crossing out the incorrect terms.

a. Pumping

b. Floating

c. Swivel

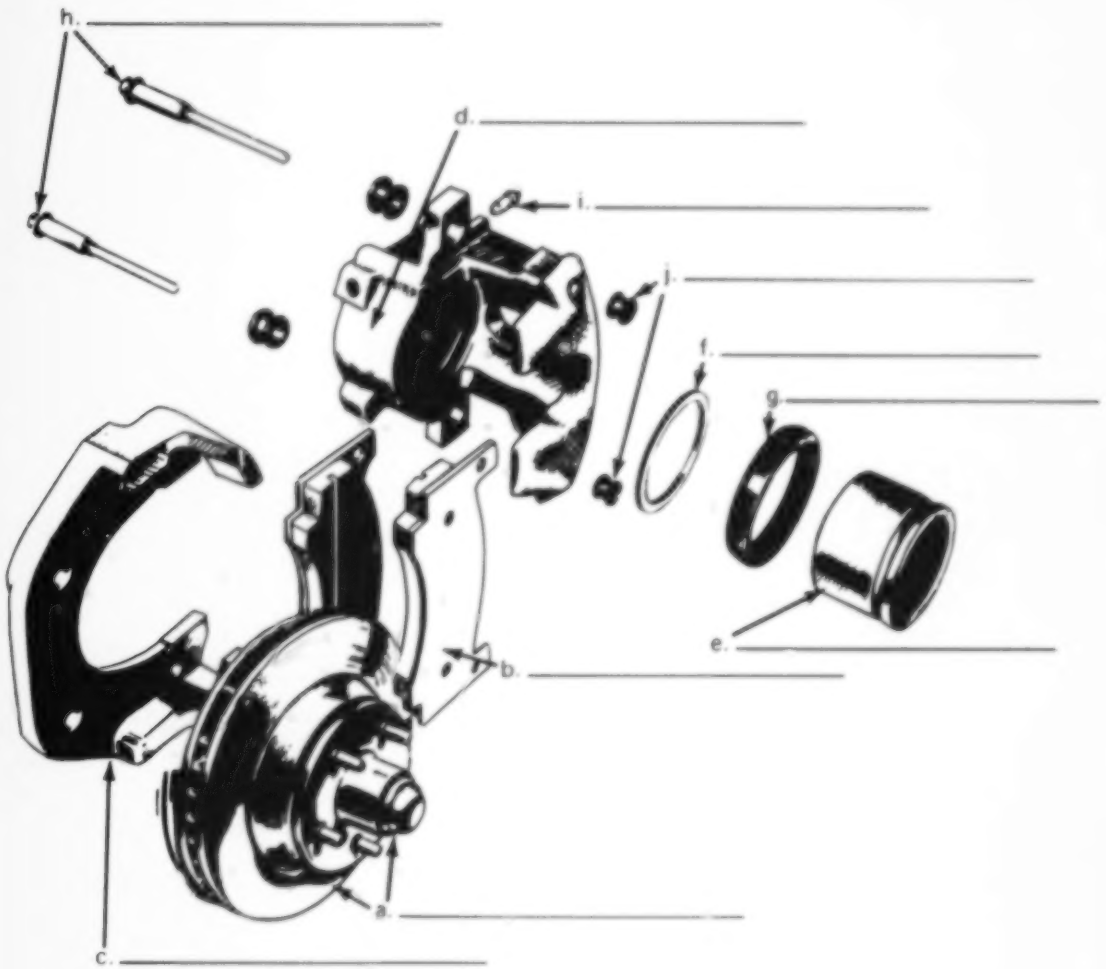
d. Fixed

e. Sliding

f. Variable

5. Identify the parts of the floating caliper disc brake by labeling the illustration with the terms below.

Shoe and lining	Boot
Caliper	Disc and hub assembly
Bleeder screw	Mounting bolts
Seal	Caliper adapter
Piston	Bushings



6. List good characteristics of disc brakes by completing the following statements.

   a. Disc brakes are _____ resistant.

   b. They provide more _____ stopping of the vehicle.

   c. They are more efficient in _____ conditions.

   d. Their _____ design makes maintenance easier.

   e. They are better adapted to _____ vehicles.

7. Discuss reasons that disc brakes may require power booster units by filling inthe blanks in the following paragraph.

   Drum brakes use large shoes which provide a large friction surface for stopping the vehicle. Power booster units are often required for disc brakes since the disc shoe linings have a smaller contact _____ than do drum brakes. Also, with drum brakes, the amount of pressure exerted by depressing the brake pedal is multiplied greatly, as much as four to five times the pressure of a disc brake without a power booster unit. This increased action is called _____ action, and is not produced in a disc brake system.

8. List two types of energy used for power boosters by selecting the correct answers from the list below.

Solar	Hydro	Hydraulic pressure
Gas-powered	Electrical	Pneumatic pressure
Engine vacuum	Kinetic	Atmospheric pressure

   a._____ b._____

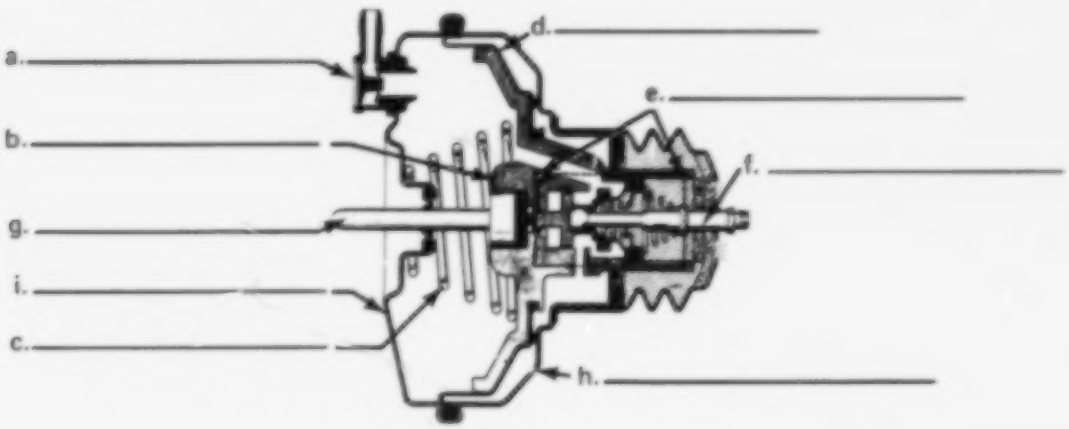
9. List two types of vacuum operated power boosters by selecting the correct answers from the list below.

Hydro	DOT	Atmosphere
Pneumatic	Vacuum	Caliper
Servo	Hydraulic	Power

   a._____ suspended b._____ suspended

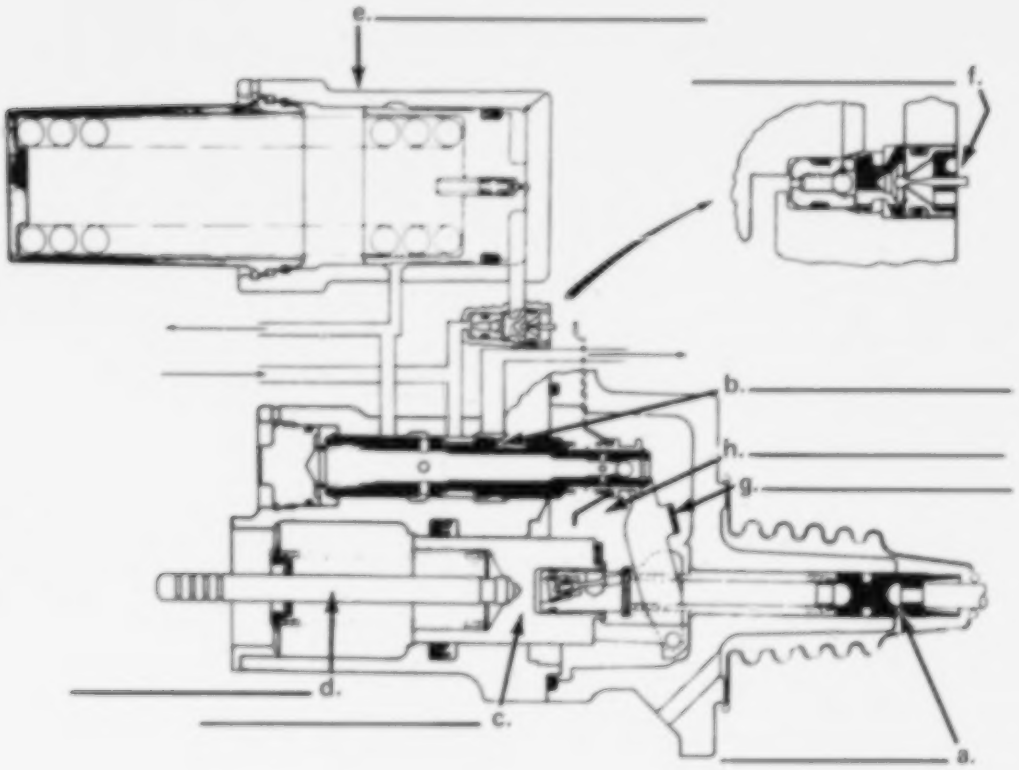
10. Identify the parts of the vacuum operated power booster in the illustration below by selecting from the following terms.

Front housing	Vacuum check valve
Diaphragm and valve body plate	Power piston return spring
Brake pedal push rod	Floating control vavle
Power piston	Master cylinder push rod
Rear housing	



11. Identify the major parts of the hydro-boost power booster in the illustration below by selecting from the following terms.

Control valve	Accumulator
Output rod	Input rod
Control valve reaction lever	Accumulator control valve
Boost pressure chamber	Boost piston



12. Discuss the operation of the vacuum suspended power booster by completing the following paragraph.

In the at-rest position, vacuum is on _____ sides of the diaphragm. As the brake pedal is applied, the pedal push rod actuates the _____ valve and allows _____ pressure to enter the front side of the diaphragm which assists the driver in applying force on the master cylinder _____. The amount of force applied by the driver controls the amount of atmospheric pressure that can enter the _____ to control braking effort.

13. Discuss the operation of the atmospheric suspended power booster by completing the following paragraph.

In the at-rest position, _____ pressure is on both sides of the diaphragm. As the brake pedal is applied, the pedal push rod actuates the control valve which directs a controlled amount of _____ to the _____ side of the diaphragm while the atmospheric pressure on the _____ side

assists the driver in applying the brakes. The force applied by the driver controls the amount of _____ extended in the chamber to control braking effort.

14. Discuss the operation of the hydro-boost power booster by completing the following paragraph.

As the brake pedal is depressed, it moves the pedal rod and initiates movement of the _____ valve and allows _____ pressure from the power steering pump to enter the _____ _____ to provide force on the boost piston to assist the driver in applying the brakes. Additional movement of the brake pedal will restrict fluid flow between the power steering pump and _____ _____, causing the power steering pump to increase its pressure for more power assist if needed.

15. List six requirements of super heavy-duty brake fluid by crossing out the incorrect characteristic in each pair.

a. Low/High boiling point.

b. Low/High freezing point.

c. Consistent/Variable viscosity.

d. Corrosive/Noncorrosive.

e. Water tolerant/intolerant.

f. Lubricating/Friction-inducing ability.

16. Discuss conditions that are considered normal and are not indications that the master cylinder needs service by completing the following statements.

a. Unequal brake fluid levels on master cylinder reservior -- This condition is caused by displacement of fluid from the reservoir to the _____ to compensate for normal lining wear.

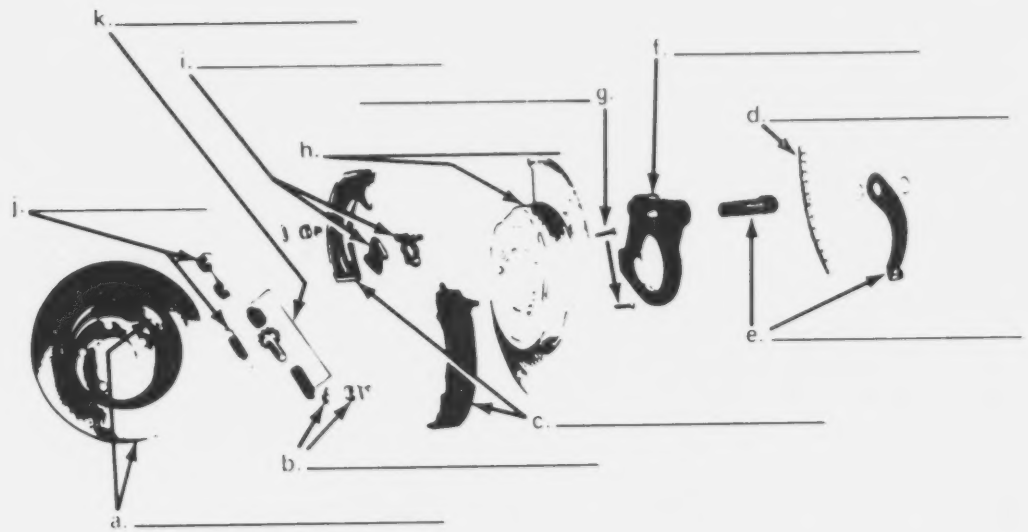
b. Momentary or slight squirt of brake fluid from one or both master cylinder reservoir chambers upon application of the brake pedal -- This is caused by the fluid displacement through the cylinder _____ _____ as the piston moves forward in the bore.

c. Slight turbulence in the reservoir fluid occurring when the brake pedal is released -- This is the result of brake fluid returning from the releasing _____ _____.

d. A trace of brake fluid on the power booster housing below the master cylinder mounting flange -- This results from the lubricating action of the master cylinder _____ _____.

17. Identify the parts of the parking brake system on four wheel disc brakes in the illustration below by selecting from the following terms.

Parking brake adapter	Parking brake cable
Parking brake shoes	Splash shield and support plate
Adjuster assembly	Shoe actuator and cam
Shoe hold-down nails	Actuating lever and shaft
Parking brake drum and disc assembly	Shoe return springs
Shoe hold-down spring assembly	



18. Stop. Have your instructor evaluate your Assignment Sheet and mark the areas below which require additional study.

Refer to Information Sheet, Sections:

I_____	X_____
II_____	XI_____
III_____	XII_____
IV_____	XIII_____
V_____	XIV_____
VI_____	XV_____
VII_____	XVI_____
VIII_____	XVII_____
IX_____	

If none of the above study areas are checked, proceed to LAP Step 6. Otherwise, continue to LAP Step 5.

BRAKE SYSTEM
UNIT II

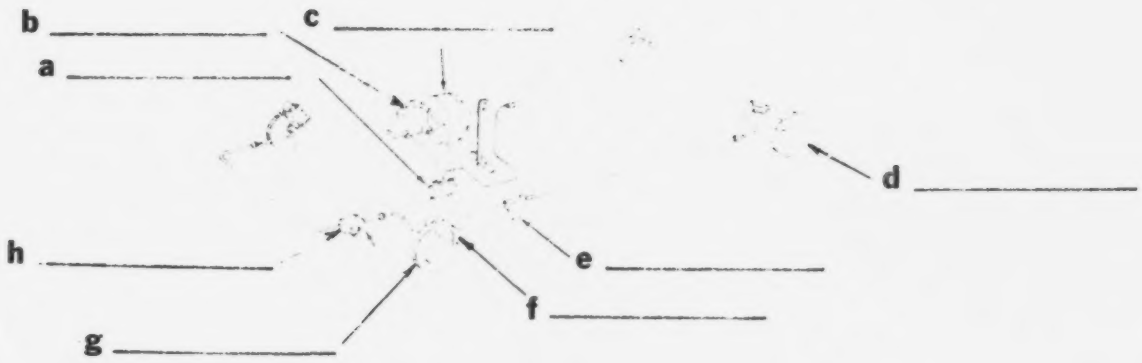
LAP ASSIGNMENT SHEET #2--POWER DISC BRAKES

NAME_____ SCORE_____

1. Match the terms on the right to the correct definitions.

_____a.	Brake system utilizing a caliper which compresses brake shoes against a circular disc	1. Disc brakes
_____b.	Condition caused by heat or moisture that decreases friction and the braking power of the system	2. Outboard shoe
_____c.	Larger action that results from a smaller input action	3. Manifold vacuum
_____d.	Vacuum or hydraulic operated unit that is designed to assist the driver when applying the brakes	4. Brake fade
_____e.	Resistance to relative movement between two bodies in contact	5. Hydro-boost
_____f.	Power assist unit operated by hydraulic pressure from the power steering pump	6. DOT
_____g.	Pressure lower than atmospheric pressure developed in the engine intake manifold and cylinders by the movement of the pistons in the cylinders	7. Power booster
_____h.	Shoe next to the single piston in the caliper and on the vehicle frame side of the brake disc	8. Friction
_____i.	Shoe opposite the caliper frame and outside the brake disc	9. Inboard shoe
_____j.	Department of Transportation; federal government agency whose function is to set standards for safety items on motor vehicles	10. Servo action

2. Identify the major components of the disc brake system in the illustration below.



3. Match the disc brake system components on the right to the correct functions.

_____a. Regulates the hydraulic pressure to the front disc brakes in the 3 to 135 psi range to allow the rear drum brake shoes to begin brake action to prevent locking of the front brakes especially on icy or slick surfaces.

_____b. Senses unbalanced pressure between the front and rear brake systems and causes the warning light to shine.

_____c. Contains friction linings and a hydraulic piston to supply force on the linings to stop the rotor.

_____d. Forces brake fluid into all wheel cylinders when brakes are applied.

_____e. Assists the driver in applying the brakes.

_____f. Regulates rear brake system hydraulic pressure to prevent premature rear wheel skid on emergency stops.

_____g. Provides a friction surface for the lining to exert a force resisting the rotation of the wheel.

1. Disc or rotor assembly
2. Metering valve
3. Master cylinder
4. Power booster unit
5. Caliper assembly
6. Proportioning valve
7. Pressure differential valve

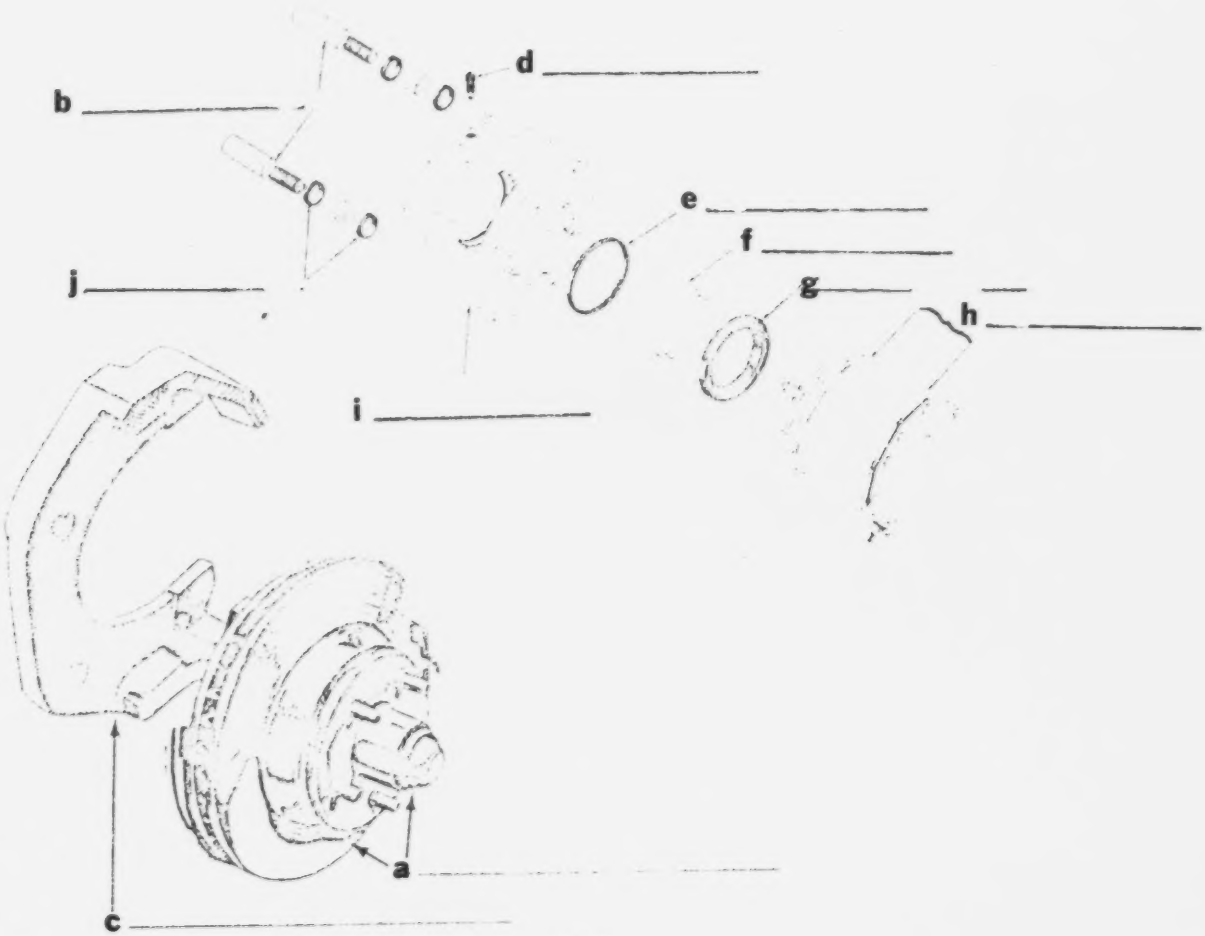
4. List the three types of disc brake calipers.

   a.

   b.

   c.

5. Identify the parts of the floating caliper disc brake by labeling the illustration below.



6. List good characteristics of disc brakes.

   a.

   b.

   c.

   d.

   e.

7. Discuss reasons disc brakes may require power booster units.

8. List two sources of energy used for power boosters.

   a.

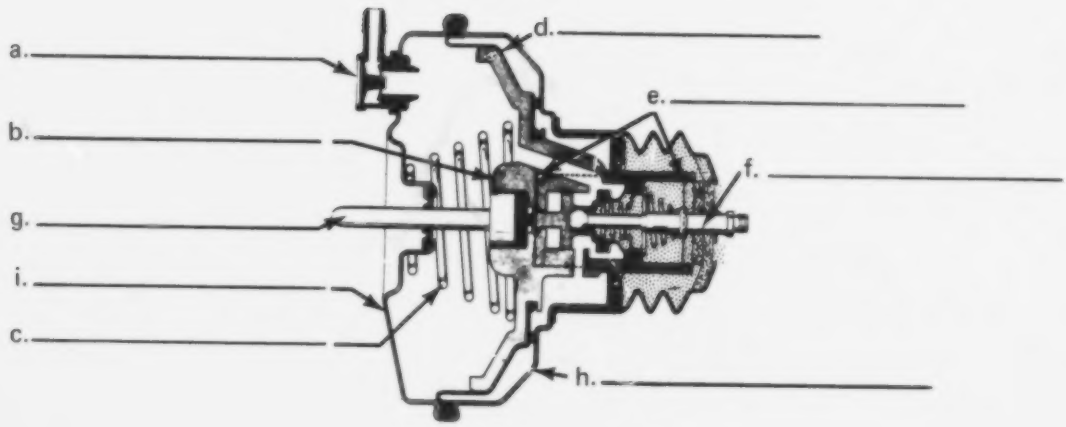
   b.

9. List two types of vacuum operated power boosters.

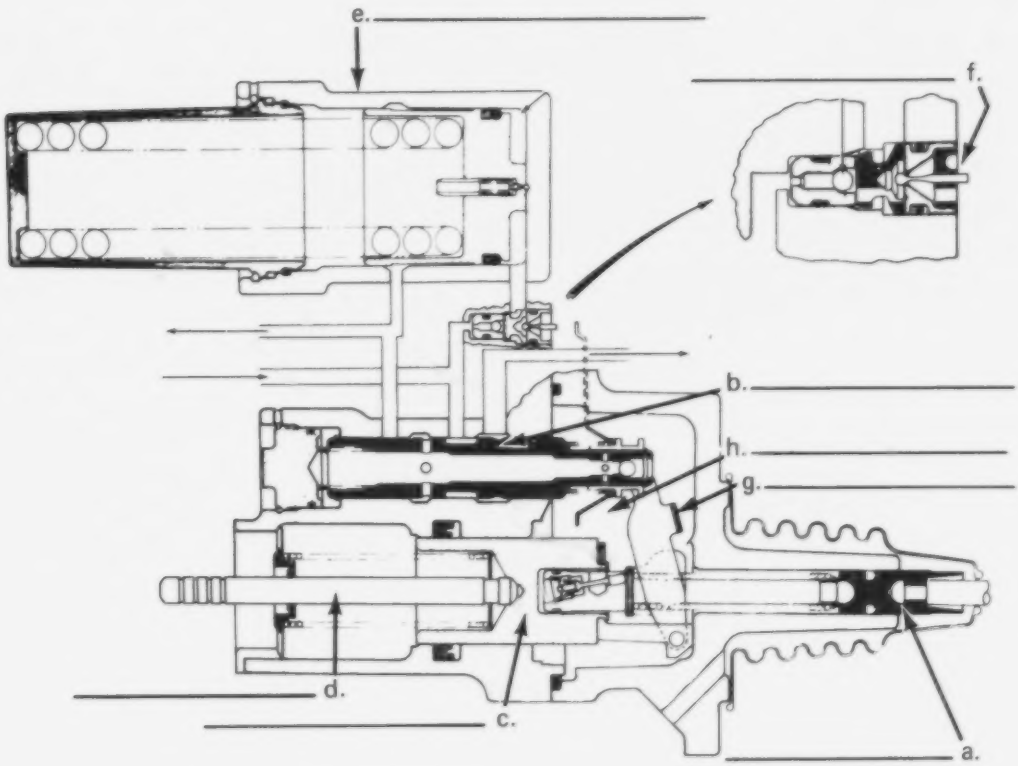
   a.

   b.

10. Identify the parts of the vacuum operated power booster in the illustration below.



11. Identify major parts of the hydro-boost power booster in the illustration below.



12. Discuss the operation of the vacuum suspended power booster.

13. Discuss briefly the operation of the atmospheric suspended power booster.

14. Discuss briefly the operation of the hydro-boost power booster.

15. List six requirements of super heavy-duty brake fluid.

a.

b.

c.

d.

e.

f.

16. Discuss conditions that are considered normal and are not indications that master cylinder needs service.

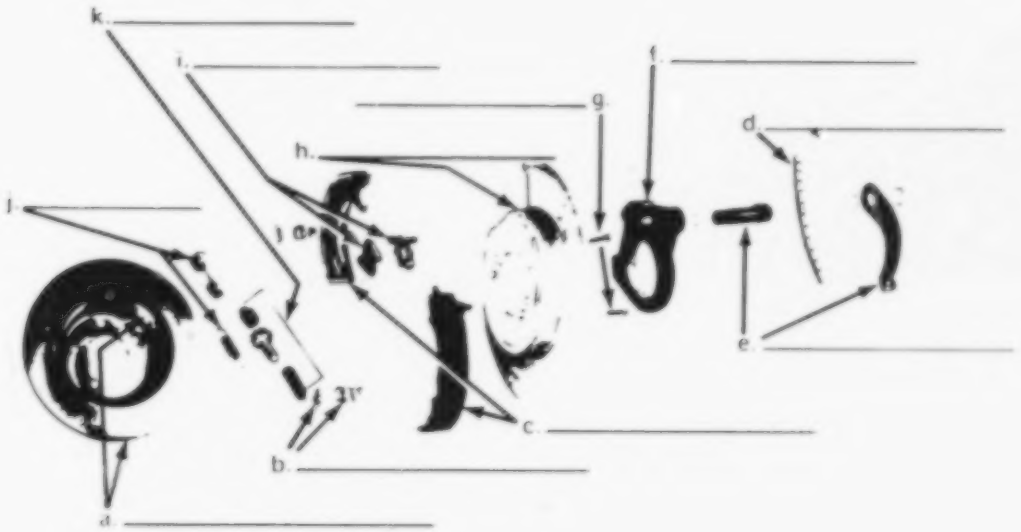
a. Unequal brake fluid levels in master cylinder reservoir--

b. Momentary or slight squirt of brake fluid from one or both master cylinder reservoir chambers upon application of the brake pedal --

c. Slight turbulence in reservoir fluid occurring when the brake pedal is released--

d. A trace of brake fluid on the power booster housing below the master cylinder mounting flange--

17. Identify the parts of the parking brake system on four wheel disc brakes in the illustration below.



18. Stop. Have your instructor evaluate your Assignment Sheet. If your instructor is satisfied with your progress, continue to LAP Step 6. If additional study is required, discuss a program with your instructor. Once you have completed that program to your instructor's satisfaction, continue to LAP Step 6.